

MACHINERY

JUNE 14, 1961

ONE SHILLING & THREEPENCE

EASIER STILL TO OPERATE WITH

*Push-Button
Controls*

TECHNOLOGY
DEPARTMENT

on
the
new
**3N PARKSON
MILLERS**

ALSO CONTROLLED
ELECTRICALLY

Start - Spindle drive
motor

Spindle drive motor
Forward-Off-Reverse

Lamp-brake ON

Master Stop

Lamp-supply ON

Isolator interlocked
with hinged door

INCH

START

STOP

START

STOP



28 Spindle Speeds	17 to 1000	} r p m
in range as	or 23 to 1330	
selected.	or 25 to 1500	

TABLE

Size

Movements

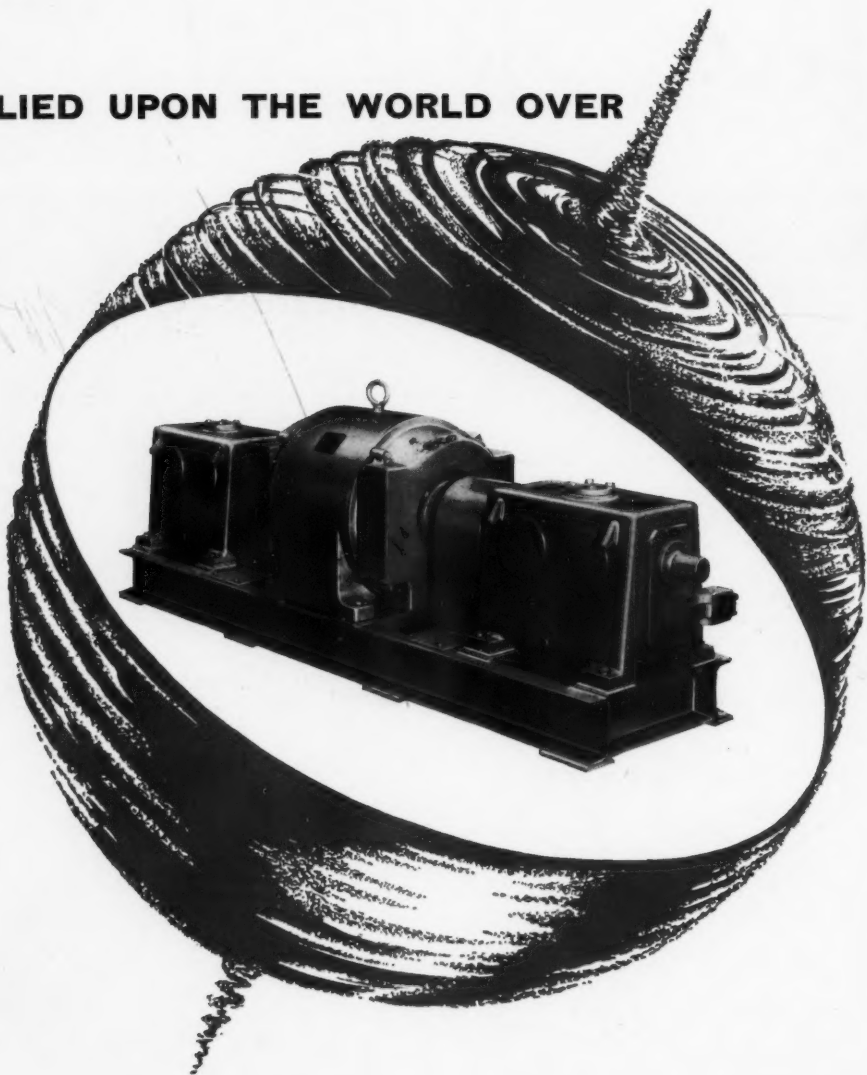
Plain	70 x 16½	1780 x 420	40 x 12 x 18	1015 x 305 x 455
Universal	60 x 14	1525 x 355	36 x 12 x 18	915 x 305 x 455
	English (inches)	Metric (mm.)	English (inches)	Metric (mm.)

J. PARKINSON & SON
(SHIPLEY) LIMITED
SHIPLEY · YORKSHIRE
ENGLAND

TELEPHONE SHIPLEY 53231

MACHINERY
JUNE 14, 1961

RELIED UPON THE WORLD OVER



ELECTRAULIC
PUMPS
CONTROLS
AUTODRAULIC

TOWLER HYDRAULIC SYSTEMS

TOWLER BROTHERS (PATENTS) LTD.
RODLEY NEARL EEDS ENGLAND
Tel: Pudsey 3125/6/7/8 Grams: 'Electrolic' Rodley

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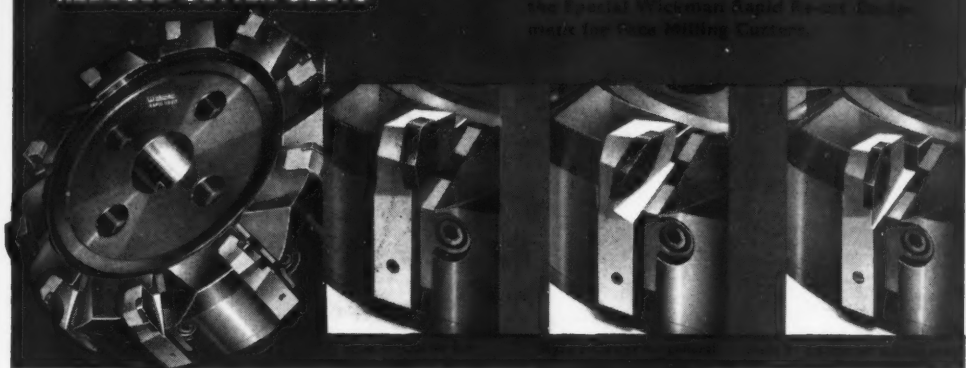
RAPID RE-SET

Face Milling Cutters

Secure

RAPID BLADE RE-SETTING
RAPID RE-SERVICING
REDUCED CUTTER DOWN TIME
REDUCED CUTTER COSTS

The Wickman Rapid Re-set system brings even higher efficiency in production milling. Reshaping of Milling Cutters is quicker and simpler by utilizing the off-line grinding method together with the Special Wickman Rapid Re-set Body made for Face Milling Cutters.



RAPID RE-SET EQUIPMENT

The use of the Wickman Rapid Re-set Cutter Body and three blade styles available provides a simple variation of blade geometry.

The blades can be removed, re-ground, checked and replaced in any Cutter Body size within the range—WITHOUT REMOVING THE CUTTER BODY FROM THE MACHINE, thus reducing down times and costs to a minimum.

WRITE FOR YOUR COPY OF THE
 NEW WICKMAN FOLDER
 "WICKMAN RAPID RE-SET FACE
 MILLING CUTTERS"
 FOR THE FULL STORY.

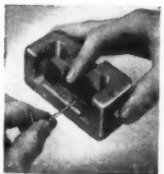


◀ **GRIND**—with special jig

GAUGE—for accuracy



◀ **RE-SET**—in setting block



WICKMAN



LIMITED

WIMET DIVISION, TORRINGTON AVENUE, COVENTRY.

Telephone 66621

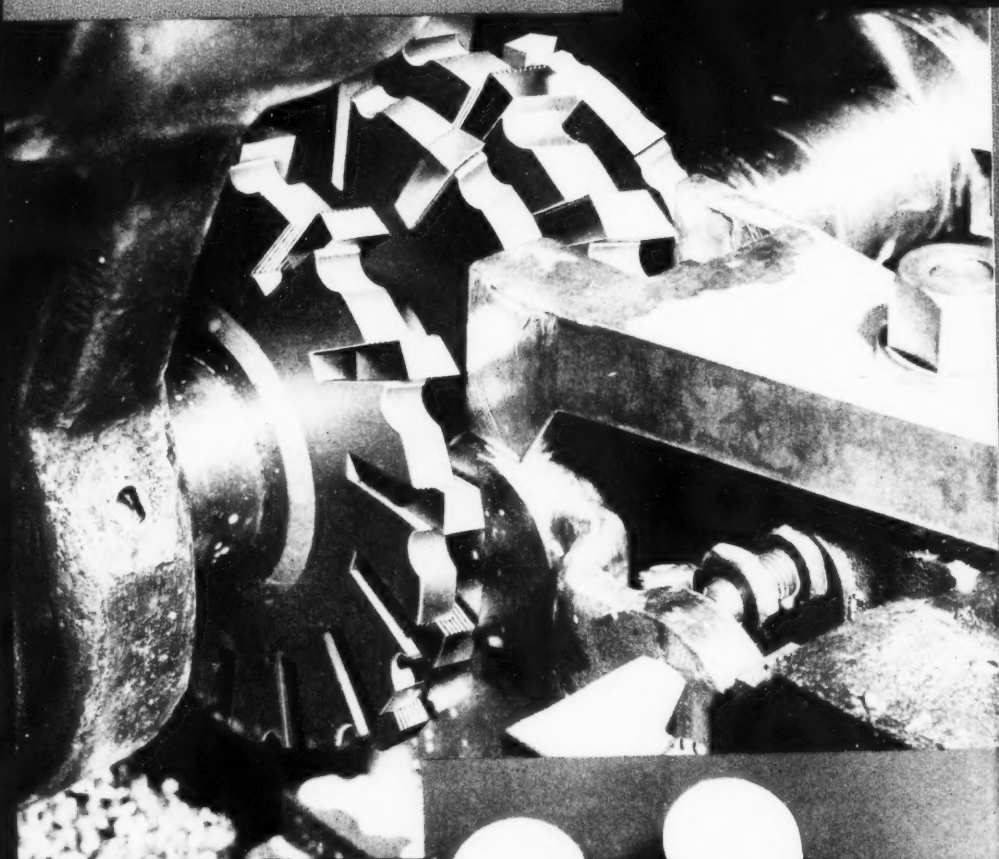
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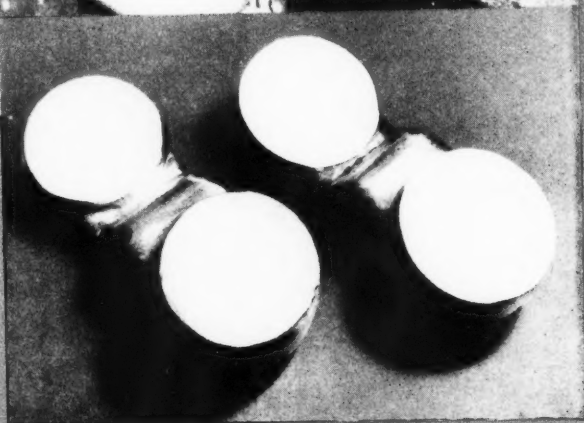
A

LEYLAND MOTORS USE -----

Galtona
TRADE MARK



*Front engine shackles
are set-up in pairs and
straddle milled to width
as shown.*

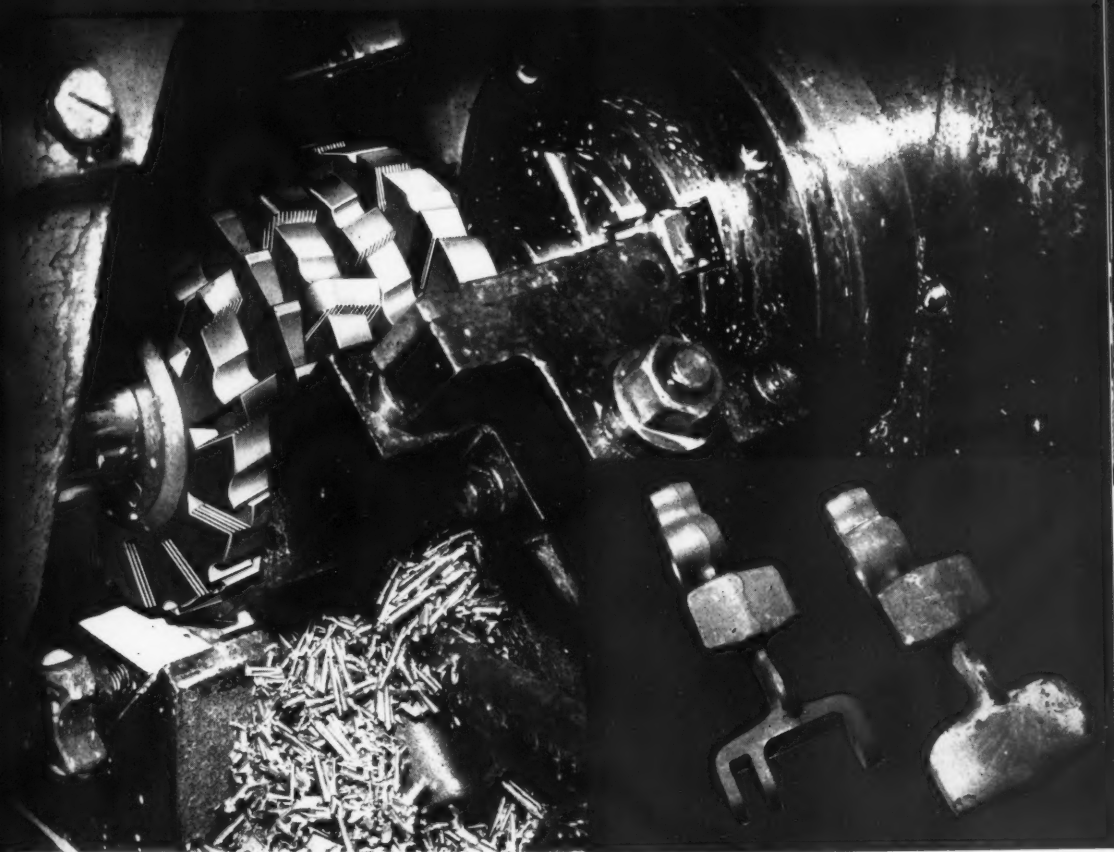


WINTER

At
the
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Our
be ha
with
produ
we in
touch

SERRATED BLADE CUTTERS



*Above we show
the milling from
solid of brake
levers using a gang
of four cutters.*

Leyland Motors Ltd., Leyland, Lancs., rely on GALTONA serrated blade cutters for a wide range of operations where maximum production, combined with long life between the grinds is important.

RICHARD LLOYD LIMITED

GALTON HOUSE, ELMFIELD AVENUE, TYBURN, BIRMINGHAM, 24

Telephone: Ashfield 1801, Telegrams "Cogs, Birmingham"

Our Tool Engineers will be happy to co-operate with you on your own production problems and we invite you to get in touch with us.

NORTHERN AREA OFFICE: Britannia House, Wellington Street, Leeds, 1 Phone: Leeds 21212
LONDON AREA OFFICE: 240 Romford Road, Forest Gate, London, E.7 Phone: MARYland 7304-5
NORTHERN IRELAND: Garage & Engineering Supplies Ltd., 78 Great Victoria Street, Belfast
SCOTLAND: Stuart & Houston, 5 York Street, Glasgow, C.2

Extra Holes!



...With the compliments of

DORMER

**MAKERS OF THE FINEST TWIST DRILLS
—BY ANY STANDARD**

Exceptional performances from an odd drill in a batch are of little value to the regular user of Twist Drills. Multiple drilling, repetitive drilling, production drilling, demand consistency in the working life of each tool, therefore the capacity of obtaining extra holes from every drill is an obvious advantage. The manufacture of DORMER drills is keyed to this very principle.

THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
SHEFFIELD ENGLAND

DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS

VISIT OUR STAND NO. 7404 • 7th EUROPEAN MACHINE TOOL EXHIBITION, BRUSSELS • SEPTEMBER 3-12, 1961



ALFING



ROUGHING
SEMIFINISHING
FINISHING

SPECIAL MACHINES
FINE BORING MACHINES
INDEXING MACHINES
TRANSFER LINES

ALFING-KESSLER-WERKE · WASSERALFINGEN/WUERTT. GERMANY

SALES-OFFICE: Telephone: Wilmslow 5344/5/6 Telex: Butler Wilmslow 66475

ASSOCIATED ALFING-KESSLER LTD 63 A ALDERLEY ROAD WILMSLOW CHESHIRE



LAPPING AND FINE GRINDING MACHINES

a HAHN & KOLB
design

for finishing cylindrical or flat components on one or two parallel sides either by lapping with cast-iron wheels or fine grinding with abrasive wheels.

range includes—

Models ZL500, LHD 1a and
DUPLEX DLI.

Illustrations show

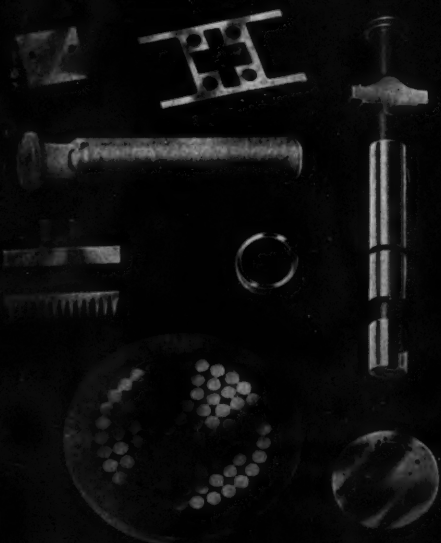
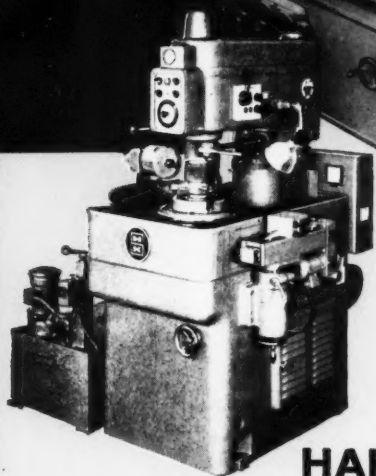
Top: Model DUPLEX DLI with
2 bottom wheels.

Bottom: Model ZL 500 with one
bottom wheel and automatic
feeding of compound.

HAHN & KOLB (Great Britain) LTD.

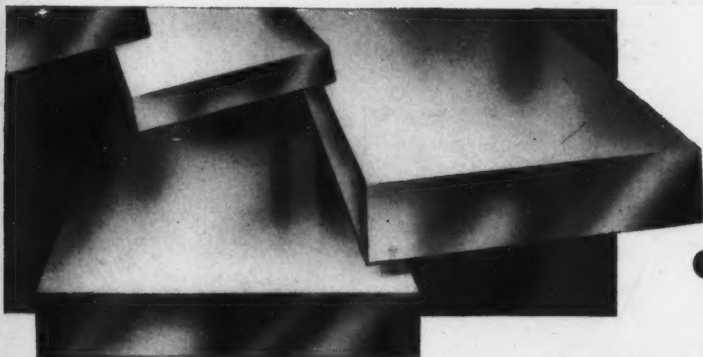
243-245 Horn Lane, Acton, London, W.3.

Telephone: ACORN 8938/9



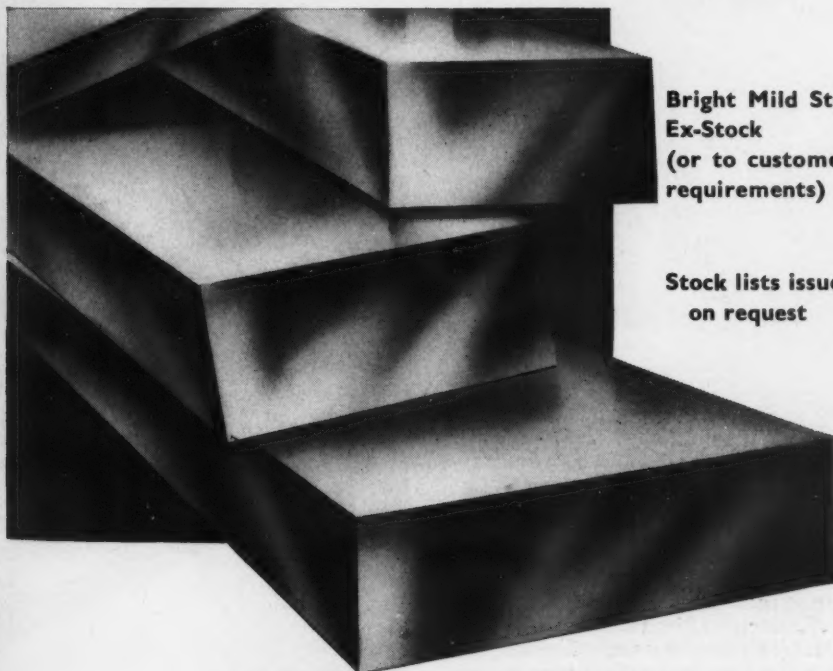
Jun

co



COGHLAN

Bright Steel Flats



**Bright Mild Steel Flats
Ex-Stock
(or to customers'
requirements)**

**Stock lists issued Monthly
on request**

Manufacturers of Rounds (turned and drawn), Squares, Flats, Hexagons, and Special Sections in mild, freecutting, casehardening, carbon and alloy steels to any specification or test.

Normalising, annealing, spheroidizing, hardening and tempering.

Approved by A.I.D., Admiralty, Lloyds, etc.

COGHLAN BRIGHT STEEL LTD., HUNSLET FORGE, LEEDS 10

Telephone : Leeds 75477 (5 lines)

Telex 55184

When answering advertisements kindly mention MACHINERY.



THE SCIENTIFIC APPROACH

Multi-channel oscillograms being made of the performance under load of a Cowlshaw Walker steel frame eccentric press at the Manchester Works of Associated Electrical Industries Ltd. This meticulous graphical analysis of the performance of this new range of eccentric presses of advanced design guarantees to the user:— higher productivity, better pressings and longer tool life.

COWLISHAW WALKER AND COMPANY LIMITED

BIDDULPH, STOKE-ON-TRENT · Phone: Biddulph 3254 London Office: 117 Victoria Street, Westminster S.W.1.
Victoria 5472

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The Planet with the Rings

Saturn is the showpiece of our Solar System.

Revolving ten times further away from the sun than the earth, it is also immensely larger ... 763 earths rolled into one would only just make up Saturn's enormous bulk.

We see the planet and its ring system from a moon called Rhea. Although these rings look solid they are, in reality, made up from myriads of tiny particles most not larger than a golf ball.

Even remote Saturn will one day be visited and in this triumph of technology over nature our Twist Drills, Reamers, Cutters and Engineers' Tools of all kinds will make an essential contribution. Balfours have always produced Tools and Steel for the World: soon it will be for the Worlds.

STEEL & TOOLS

ARTHUR BALFOUR

FOR THE WORLD

ARTHUR BALFOUR & CO LTD. CAPITAL STEEL WORKS, SHEFFIELD ENGLAND.
ASSOCIATED COMPANY: THE EAGLE & GLOBE STEEL CO. LTD.



FROM THE WORD

GO

DICKROPEs are endless rubber Vee ropes with a 'plus' rating, designed for maximum power transmission over long periods. The unique construction of DICKROPEs with their centre core of specially treated high tensile cords wrapped in a multi-ply hard-wearing jacket, enables them to carry heavier loads and give long trouble-free service on the most arduous drives. DICKROPEs because of their special construction and quality will do the work of a greater number of ordinary Vee Belts. DICKLINE has been designed as a complement to the endless rubber Vee rope for use where an endless unit is not suitable due to either structural restrictions or fixed centres. It is available in 40°

sections for replacement of standard section Vee ropes and also in 28° profiles. Dismantling costs are greatly reduced and a belt can be installed and running in a matter of minutes. There is no need to carry large stocks. Five coils of 50 ft. each in the M, A, B, C, and D profiles can provide replacements for the entire range of standard Vee ropes in these sections. Designing to standard centres can be eliminated and each belt can be individually adjusted.

DICK EQUIPMENT permits you to 'get going' and 'keep going' with lower maintenance costs.

For further information please quote reference DLR/19

R. & J. DICK LTD.

HEAD OFFICE & FACTORY
GREENHEAD WORKS, GLASGOW S.E.

Telephone: BRIdgeton 2344 (5 lines) Telegrams: "Guttapercha" Glasgow



UNITED KINGDOM

FACTORIES: Glasgow, Leeds, Blackburn.

BRANCHES: Glasgow, London, Leeds, Birmingham, Manchester, Bristol, Newcastle, Dundee, Belfast.

OVERSEAS

FACTORIES: Toledo, New Jersey; Muscatine, Iowa, U.S.A.

BRANCHES: Dublin, Amsterdam, Vienna.

CANADIAN SUBSIDIARY: Burlington, Ontario.

THE NAME WHICH MEANS DEVELOPMENT IN POWER TRANSMISSION

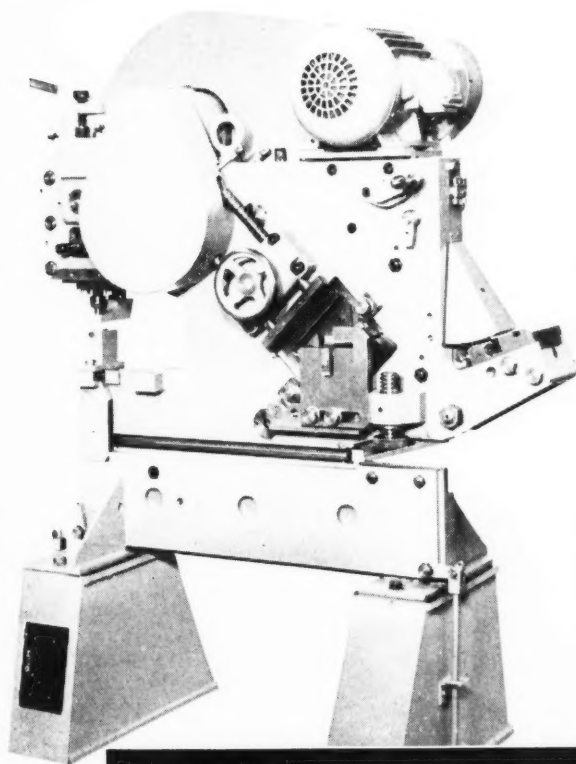
AGENCIES THROUGHOUT THE WORLD

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June 14, 1961

MACHINERY

New from



MKC10 STEELWORKER

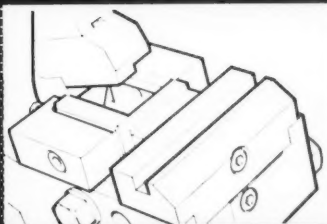
A new model incorporating all welded steel frame, hand and foot operation, interchangeable notching head and cropper carrier, twin spindle 'down-holder' and even sturdier construction.

Angle and plate punching with solid die-to-floor support. Capacity—13/16" dia. through 3/8" or 11/16" dia. through 1/2".

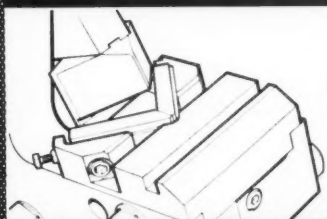
From the Pels stable at a highly competitive price . . .

Write for full quotation and capacities.

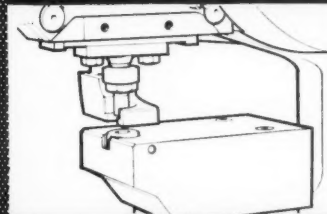
PELS



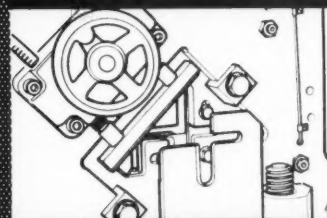
Square notching up to 3/8" thickness.



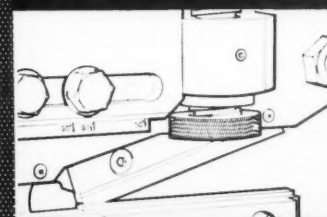
Mitre notching up to 5/16" thickness. Alternative to square notcher or supplied extra if both required.



Optional die saddle for punching into flanges of joists and channels.



Cropping up to 3" x 3" x 3/8" angles and tees.



Shearing up to 3/8" thickness



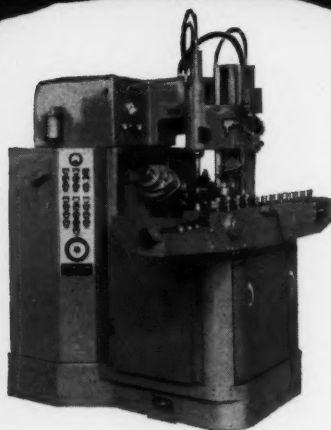
HENRY PELS & CO. LTD.

32-38 OSNABURGH ST., LONDON, N.W.1

Telephone: EUSTON 4113 . Cables: RYPELSNEH, LONDON

CHURCHILL use **VICKERS**

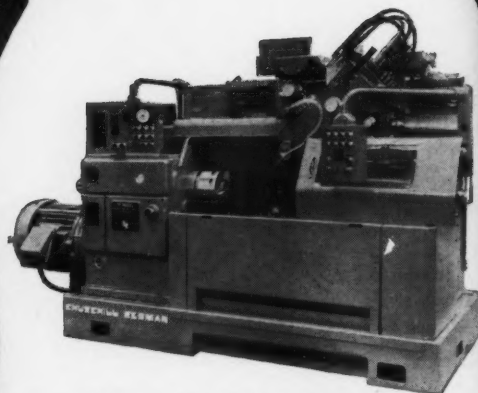
the most **ECONOMICAL** and **POSITIVE** power controls
for machine tools



The Churchill S815 Rigidhobber

A complete **VICKERS** hydraulic system is used on this machine to control movements at a definite speed and in a positive manner. The system provides:

- 1 Infeed and retraction at controlled rate to the hob head slide
- 2 Facilities for power tailstocks and tooling
- 3 Automatic loading devices



The Churchill Redman P.5 Profiling Lathe

This modern machine is fully hydraulically operated and electrically controlled by solenoid operated **VICKERS** valve units. The complete **VICKERS** hydraulic system provides:

- 1 Power chucking and tailstock operation
- 2 Carriage movement with infinitely variable feed rates
- 3 Feed slide and other various machine movements with very flexible arrangement
- 4 Profile turning slide operation
- 5 Automatic loading

The wide variety of duties which hydraulics can perform far better and at less cost than any other form of power, is well emphasised on a Link-Line of Churchill Profiling Lathes and Hobbing Machines where **VICKERS** Hydraulic Equipment is used throughout.

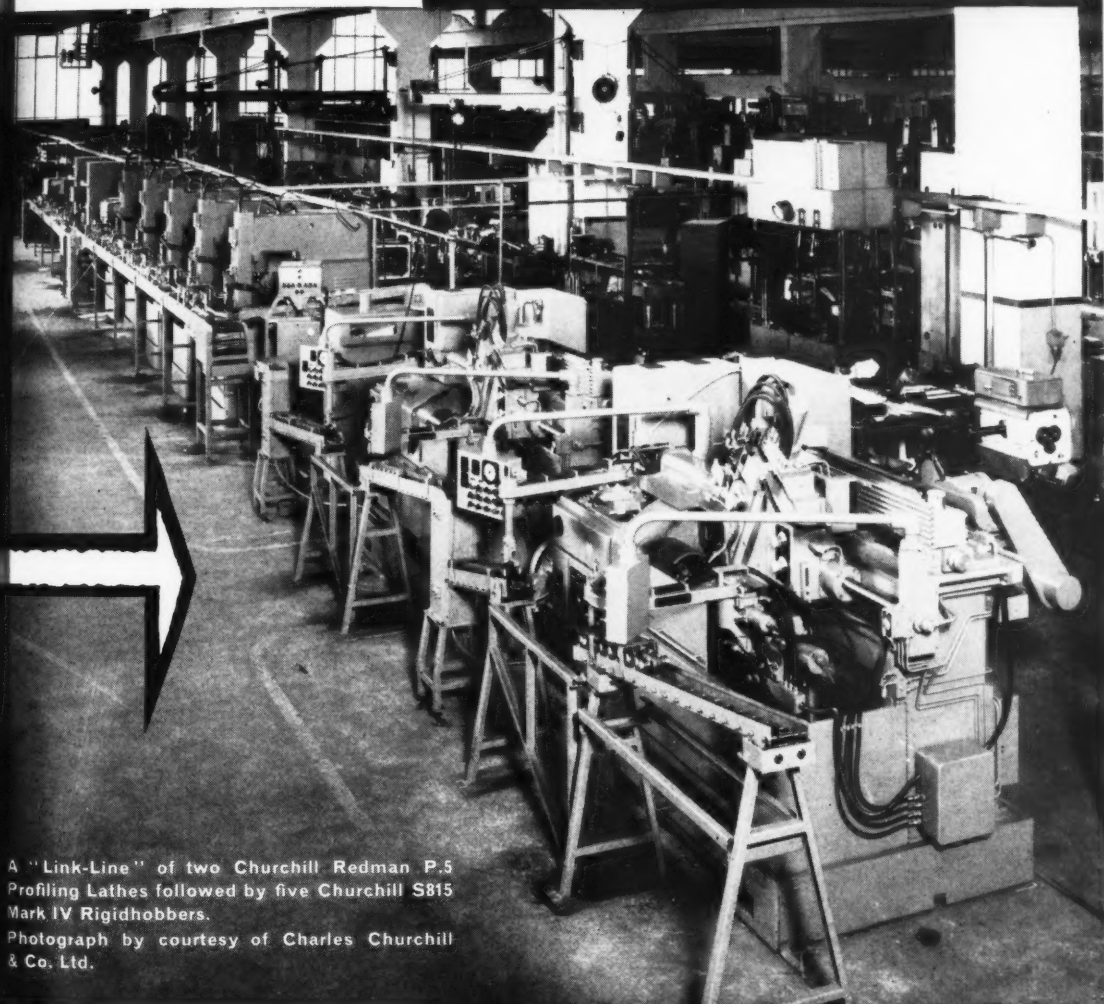
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Mark IV
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& Co. L

Hydraulics

VICKERS — the world's most
comprehensive range of hydraulic
components—manufactured in Britain
by **STEIN ATKINSON VICKERS**



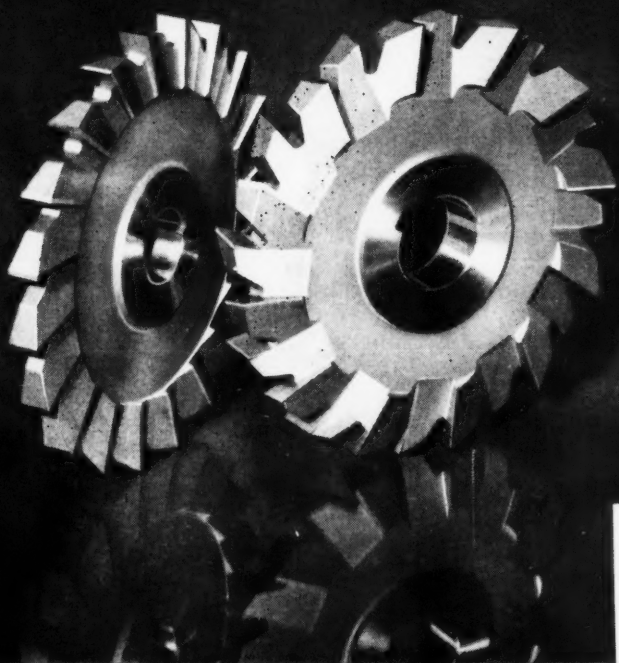
A "Link-Line" of two Churchill Redman P.5 Profiling Lathes followed by five Churchill S815 Mark IV Rigidhobbers.

Photograph by courtesy of Charles Churchill & Co. Ltd.

STEIN ATKINSON VICKERS HYDRAULICS LTD.
197 Knightsbridge, London, S.W.7.
Telephone: KNightsbridge 9641

*Technical Sales and Service at London, Glasgow
Birmingham, Leeds and Manchester.*

Manufacturers of High Quality Tools
FOR OVER A CENTURY



GEO. WALKER & SONS
(BIRMINGHAM) LTD.

WARWICK RD, TYSELEY, BIRMINGHAM, 11

PLAIN HELICAL * CONCAVE * CONVEX * SIDE & FACE CUTTERS * END & FACE MILLS * SLOT DRILLS * ETC * ETC
• LARGE STOCK AVAILABLE • LIST ON REQUEST



TELEPHONE:
ACORN
GREEN 5161

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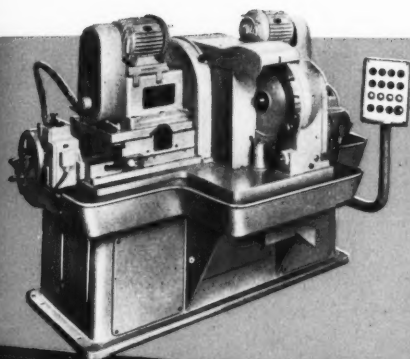
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New Development

of Special Grinding Machines

for the manufacture of roller bearings



Duplex Rotary Surface Grinding Machine PPS

For the simultaneous grinding of faces on two parallel sides, i.e., levers, shifting forks, discs, cylindrical roller ends.

Main Data:

Grinding wheel dia.	19 $\frac{1}{4}$ in.
Speed of grinding wheel	85—91 ft./sec.
Angular position of grinding slide	5°
Revolutions of workholding drum	approx. 1 r.p.m.
Number of clamping positions	max. 40
Output with automatic loading	approx. 2,000/hour
Total power required	approx. 10.5 H.P.

Internal Cylindrical Grinding Machine SI 120

Application:

The machine is suitable for automatic grinding cylindrical or taper bores (both through and blind) as well as races and roller bearing rings.

Automatic control by:

- indirect sizing (diamond control)
- plug gauge control
- or electronic sizing control.

A combination of two sizing methods is possible. A fully automatic cycle is obtained by using an automatic loading equipment.

Main Data:

Economic grinding range	1.6—4.7 in.
Grinding depth max.	5.9 in.
Taper angle to be ground up to	60°
Workpiece spindle with four speeds	180—1,080 r.p.m.
Grinding spindle speeds	6,000—15,000 r.p.m.
Grinding spindle dia.	4 in.
Table speeds infinitely variable	0.3—33 ft./min.
Max. table stroke	18.5 in.
Max. cross slide stroke (lifting)	0.4 in.
Power required	10 H.P.

Karl Hüller GmbH.

Ludwigsburg/Germany

Sole Agents British Isles:
Bishop, Eaves & Sons, Ltd.

868 Alum Rock Road,
Birmingham 8.

Telephone: East 4071.

Telex: 33461 Bisheaves
Birmingham

Hüller

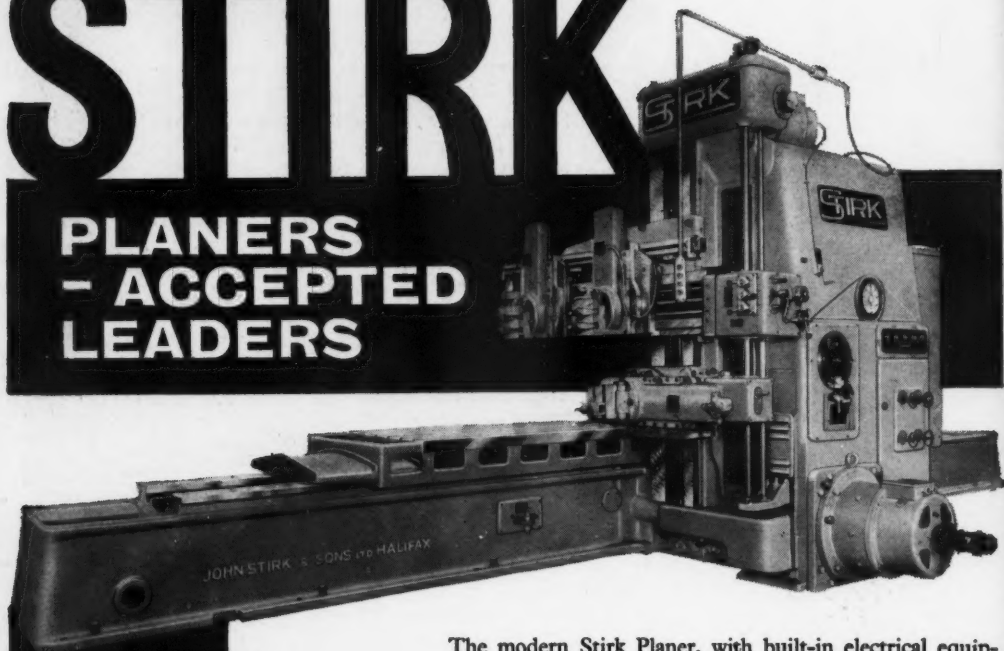


Bishop, Eaves & Sons, Ltd.

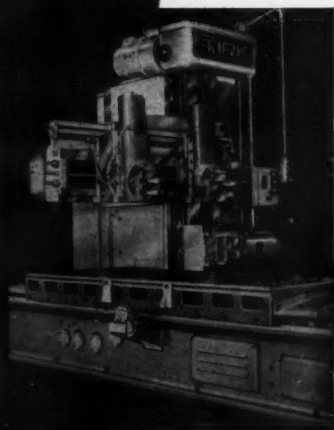
868, Alum Rock Road,
Birmingham, 8.
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STIRK

PLANERS - ACCEPTED LEADERS



The modern Stirk Planer, with built-in electrical equipment, possesses many distinctive features which make it one of the world's finest planing machines. The easy control and fine accuracy of the modern planing machine is due in no small measure to the continuous development of Stirk Planers. For more than fifty years Stirk Planers have influenced the design and set the standard by which others are judged.



JOHN STIRK & SONS LTD HALIFAX ENGLAND

Telephone: Halifax 3234/5

Grams: Stirk Halifax

STIRK

OVERSEAS AGENTS

AUSTRALIA: Gilbert Lodge & Co. Ltd., 386 Harris Street, Ultimo, Sydney, N.S.W. CANADA: Williams & Wilson Ltd., 544 Inspector Street, Montreal. FRANCE: Societe Anonyme Alfred Herbert, 1 and 3 Rue du Delta, Paris (96). HOLLAND: Esmeijer & Co., Oosterkade 24, Rotterdam C. INDIA: Alfred Herbert (India) Ltd., 13/3 Strand Road, P.O.B. 681, Calcutta 1. NEW ZEALAND: Gilbert Lodge & Co. Ltd., Head Office: 55, Station Road, P.O.B. 12-063, Penrose, Auckland S.E.6. N.Z. also at Christchurch and Wellington. PAKISTAN: Guest, Keen & Nettelfolds in Pakistan Ltd., P.O.B. 819, Bank of India Buildings (3rd Floor), Bunder Road, Karachi. SPAIN: Osmunio S.A. Gran Via 48, Apartado 920, Bilbao. KENYA, UGANDA, TANGANYIKA & ZANZIBAR: Len Cooper Ltd. P.O.B. 3796, Nairobi, Kenya. SWEDEN: Aktiebolaget Servus, Malmkillnadegatan 46, Stockholm

When answering advertisements kindly mention **MACHINERY**.

1

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June 1

Orn



Rolled thread screws

Take no chances about your supplies of Rolled Thread Screws—specify **ORMOND** and so make sure of both quality and quantity—delivered right on time and straight from our extensive stocks. For your individual requirements, we will gladly submit special quotations. Send for lists, which in addition to detailing Brass, Steel and Light Alloy Screws in Rolled and Cut Threads, also feature Grub-screws, Nuts, All-threads, Hexagon Bolts and Set-screws turned from bar and Cold Headed Grades "A", "B" and High Tensile. The repetition parts range covers single and multi-spindle automatics up to 1½" diameter.



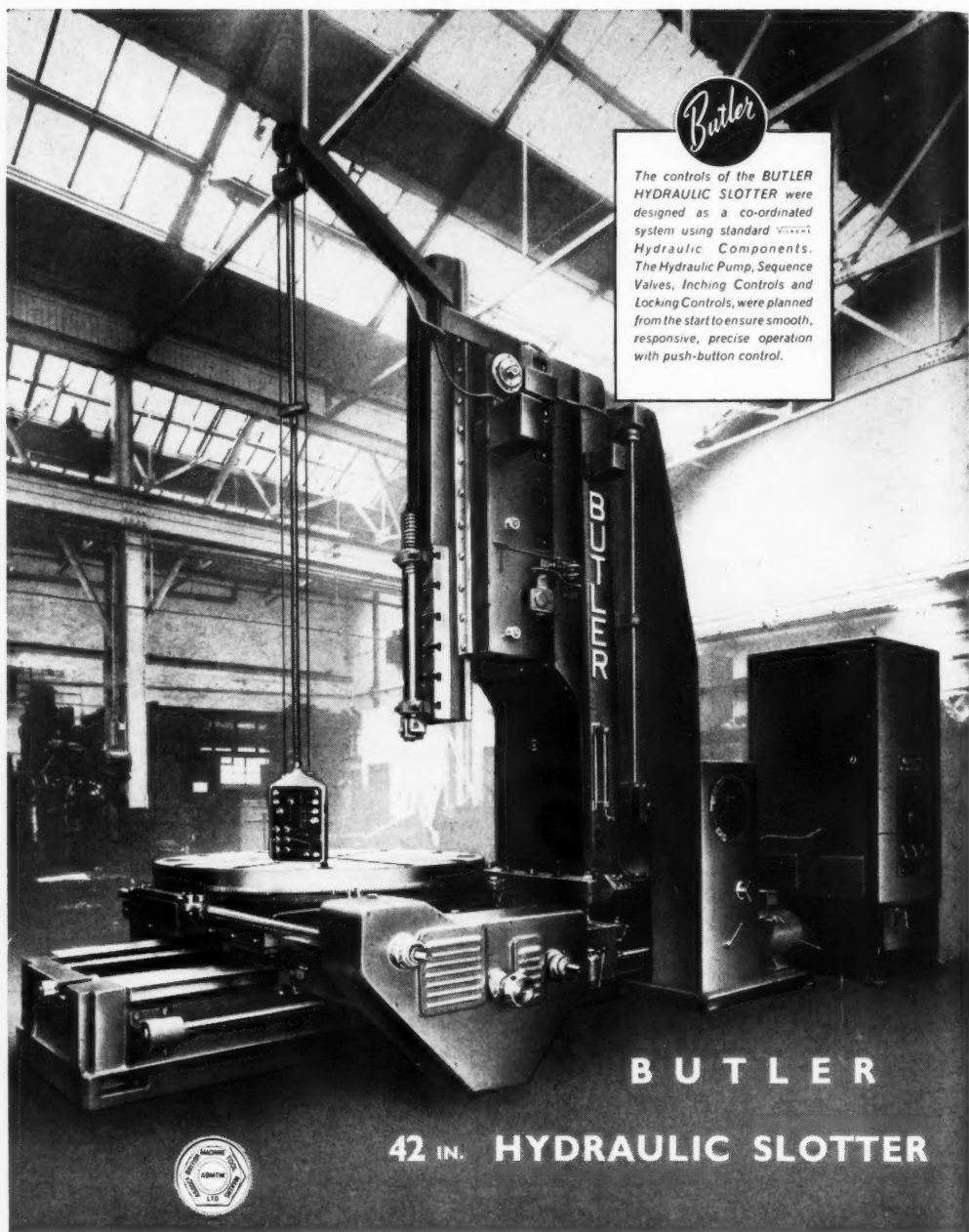
THE ORMOND ENGINEERING CO. LTD.

Ormond House • Rosebery Avenue • London, E.C.1

Telephone: TERminus 2888

Telegrams: "Ormondengi. Cent"

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Butler

The controls of the BUTLER HYDRAULIC SLOTTER were designed as a co-ordinated system using standard Hydraulic Components. The Hydraulic Pump, Sequence Valves, Inching Controls and Locking Controls, were planned from the start to ensure smooth, responsive, precise operation with push-button control.

BUTLER

42 IN. HYDRAULIC SLOTTER



The **BUTLER MACHINE TOOL CO. LTD.**

**HALIFAX
ENGLAND**
TELEPHONE 61641

FOR PLANING SHAPING AND SLOTTING MACHINES

For Maximum Production



Photographs by courtesy of British Railways, Mechanical Department

Ward

10/13 COMBINATION TURRET LATHE

having Hydraulic Actuation of
Driving Clutch giving finger-tip
Gear Change.

29in swing over bed covers

'PRELECTOR'
Combination Turret
Lathes
with Preselective
speed-changing.

TURRET LATHES
with capacities up
to 35 in. swing over bed

11 in. to 21 in. 'D-S'
DOUBLE-SLIDE
Capstan Lathes
for heavier
accurate work.

Stock Tools,
Toolholders, Chucks
and Accessories
for Capstan and
Turret Lathes.

H. W. WARD & CO LTD

SELLY OAK, BIRMINGHAM 29
Phone: Selly Oak 1131



W 680

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B2

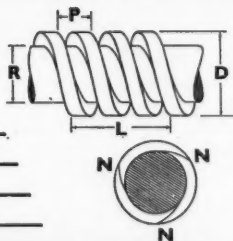


KINGSTON

**ACTUAL MANUFACTURERS OF PRECISION TRANSMISSION
SCREW THREADS ($\frac{5}{8}$ " dia. to 10" dia. : up to 30' long according to dia.) AND NUTS
—ALSO EXTRUDER SCREWS FOR THE PLASTICS INDUSTRY**

The following information will be of assistance when making enquiries:—

TYPE OF THREAD _____
HAND OF THREAD _____
PITCH (P) _____
LEAD (L) _____
No. OF STARTS (N) _____
OUTSIDE DIAMETER (D) _____
ROOT DIAMETER (R) _____
TYPE OF MATERIAL _____
PURPOSE _____



KINGSTON ENGINEERING COMPANY LTD.

DANSOM LANE • HULL • YORKSHIRE
Tel. 31676 (4 lines) Grams: "Kingston 31676 Hull"

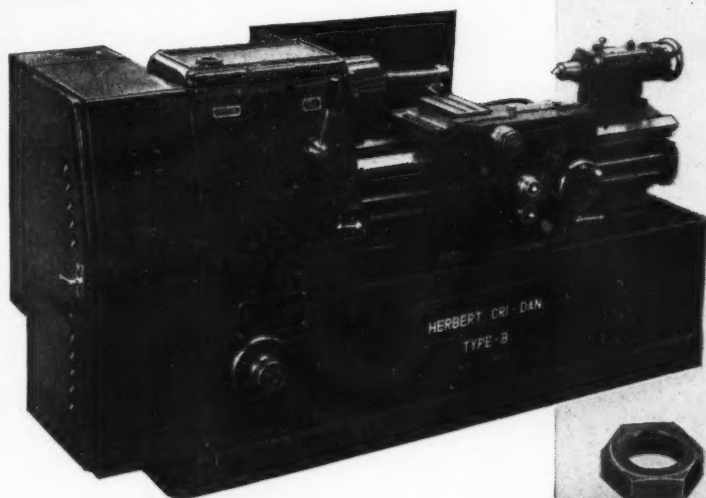
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—the
HERBERT / CRI-DAN
type B

for high speed thread chasing

Provides the fastest method of cutting external or internal, single- or multi-start, up to 64, parallel or taper, up to 24° included angle, right- or left-hand, standard full, truncated or special thread forms in most materials. Cuts threads up to 5 t.p.i. in mild steel on 4" external and 6" internal diameters up to 3½" in length. Longer lengths are cut by resetting the saddle.

Can be fitted with Hydraulic Copy-turning Attachment; work up to 4" diameter by 12" long using either a template or model as a master, can be copy turned. The unit is self-contained.



- Construction eliminates vibration.
- Pitch controlled by precision lead cam.
- Single-point tooling; carbide-tipped or high-speed steel.
- Thread depth positively controlled.
- Constant or diminishing feeds as required.

ALFRED

HERBERT

LTD., COVENTRY

AD. 474

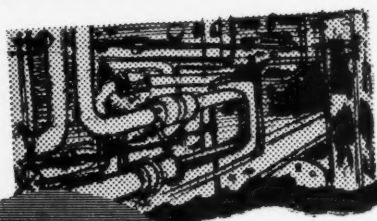


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*HydrOILics***VALVE
News****LATEST**

DENISON VALVES

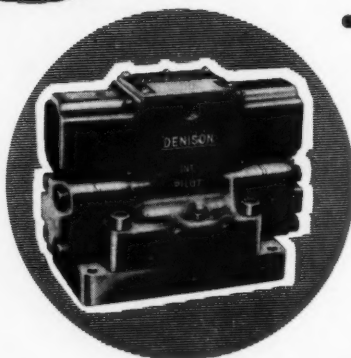
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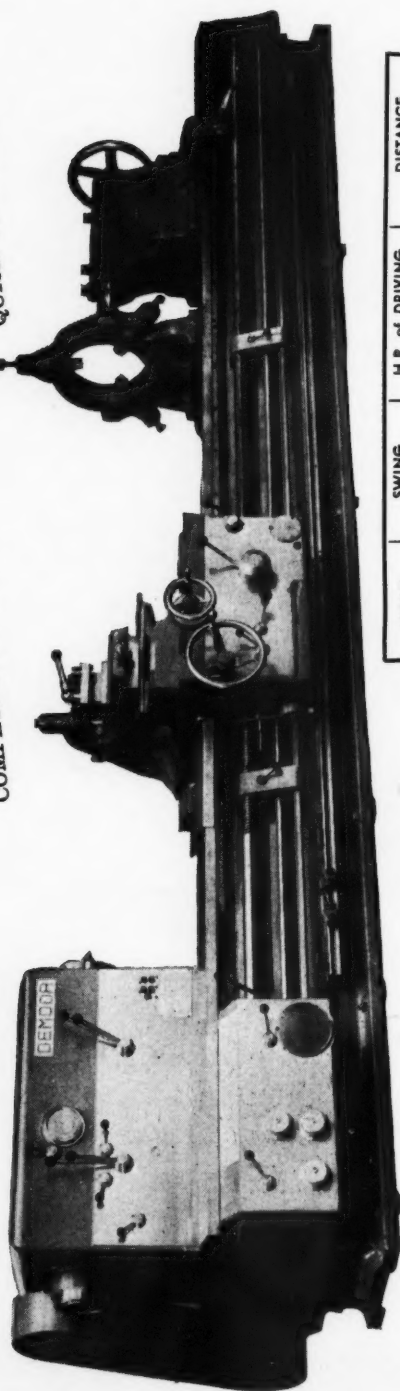
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HEAVY DUTY box bed centre lathes

MODERN DESIGN !

COMPETITIVE PRICES !

QUICK DELIVERY !



The bed of the Demoor Heavy Duty Box Bed Lathes is a robust casting of the double wall type, ensuring complete resistance to deflection—main spindle runs in two bronze and one roller bearing.

MODEL	SWING OVER BED	H.P. of DRIVING MOTOR	DISTANCE BETWEEN CENTRES
824	34½ in.	(Applicable to all models) 27.30	(Applicable to all models) 79 in. Gap or 99 in. Straight Bed
825	38½ in.		
826	40 in.		
827	41½ in.		
827 H.100	49½ in.		158 in. 198 in. Or longer on request 238 in.



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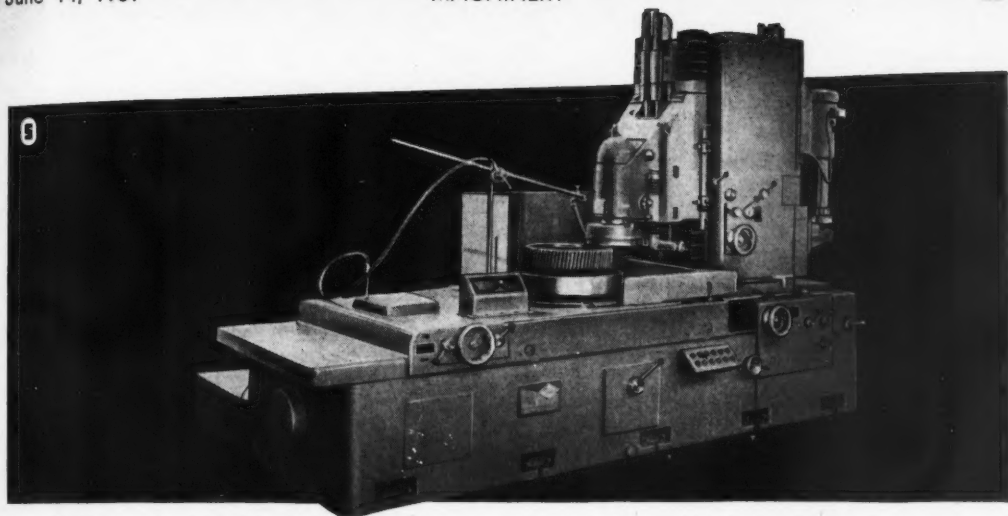


Fig. 1 Rotary Table Surface and Internal Grinder, Model "RFB" with swivel column and 2 wheelheads (Patents home and abroad).

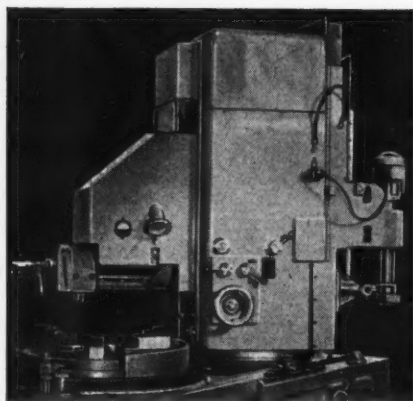


Fig. 2 Surface grinding head with periphery grinding wheel

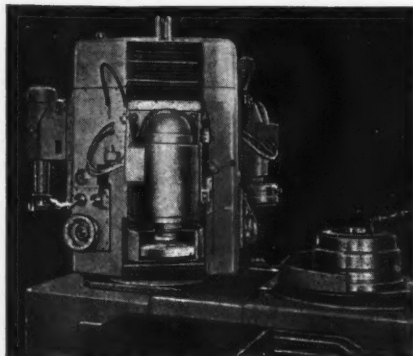


Fig. 3 Model "RFB" with 3 wheelheads

- Several grinding operations can be carried out on a component in one mounting, which guarantees absolute concentricity and parallelity of the ground surfaces.

- Mounting and truing is only done once, thus avoiding double setting times.

- The wheelheads can be adapted for the desired grinding operations.

Fig. 1: Segmental head for surface grinding

Fig. 2: Periphery grinding wheel for surface grinding

Fig. 3: 3 wheelheads, Surface -, Internal - and External Grinding

- Range of Application :

Surface grinding up to 52" diameter

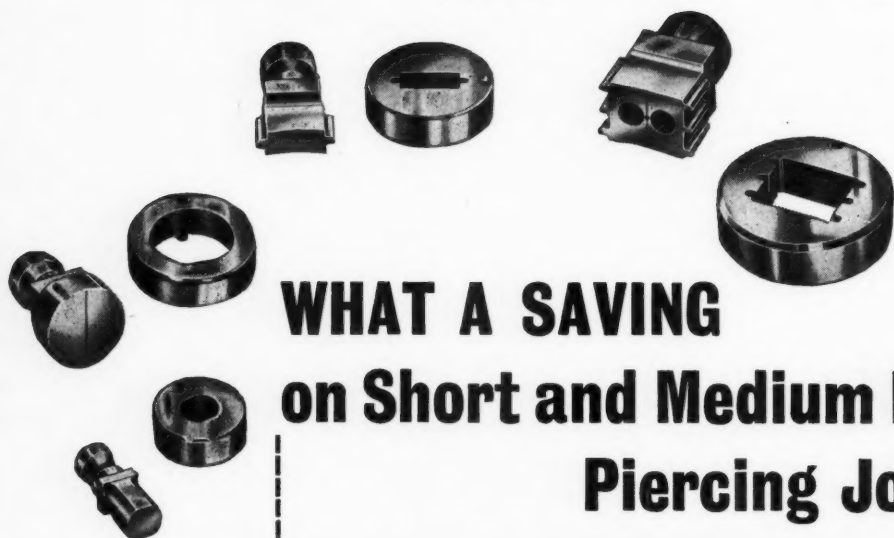
Internal grinding up to 48" diameter

External grinding up to 48" diameter



**Sole Agents: W-FERD-KLINGELNBERG SÖHNE-REMSCHIED
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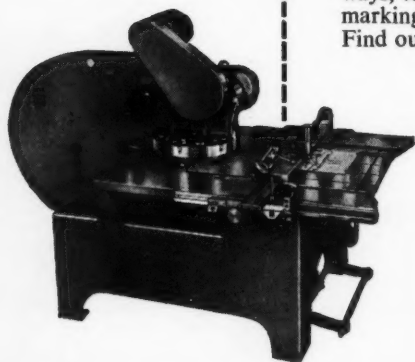
In Great Britain: Sykes Machine Tool Co. Ltd., Staines-Middx.



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Rounds, squares, ovals, clusters and shapes — you use the same tools for every piercing job with similar openings. Every tool is ready for instant use: no setting—always in accurate alignment. The Wiedemann method saves time and expense in other ways, too — reducing handling and eliminating marking out and hand finishing. So why delay longer? Find out more about this economical method today.



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Now-Really *FAST* Pressing

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HIGH SPEED HYDRAULIC PRESSES

Built solely for 'D & D' by Rhodes, Gill & Co. Ltd., specialists in high pressure hydraulics. Entire mechanism enclosed within sturdy fabricated steel frame. High ram speeds plus positive power return. Working pressure and slow advance for setting easily controlled. Pressure gauge and isolating valve provided. Compactly housed ram guides cannot foul pillars of die sets. Perspex guards available providing unobstructed view of entire table.



*5 ton bench and pedestal models.
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	5 TON	10 TON	15 TON
STROKE	4"	8"	10"
TABLE SIZE	14" x 11½"	16" x 14"	18" x 16"

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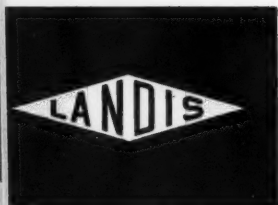
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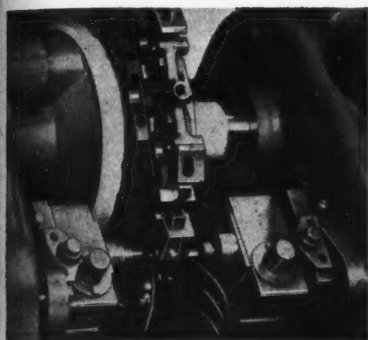
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ROTARY AUTOMATIC TURNING AND THREADING MACHINE

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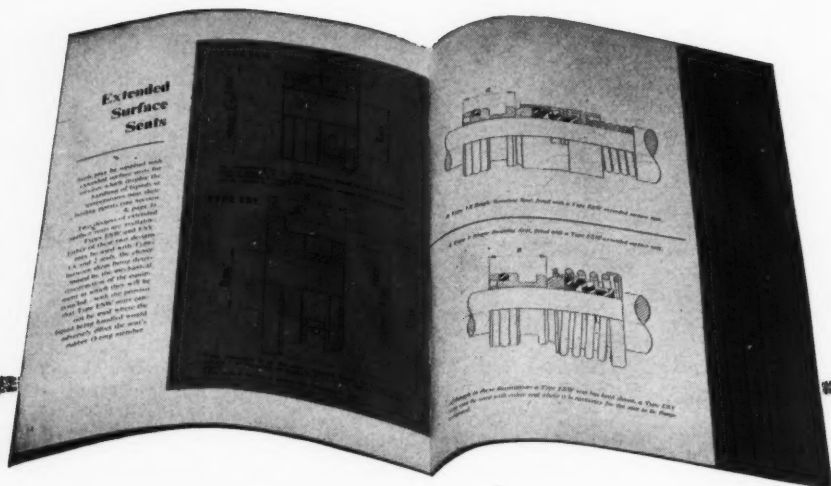
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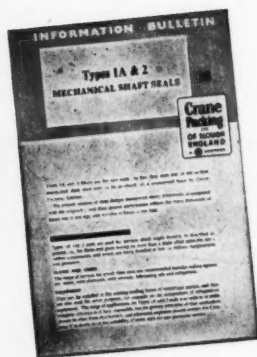
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This Information Bulletin, No. 18, contains a comprehensive description of the two seals and of the services for which they are recommended. There are also tables of sizes and other data, and a section is devoted to the newly developed extended surface seats, reference to which has recently been made in the editorial columns of technical journals.

Please write for copies of *Information Bulletin No. 18* to
CRANE PACKING LIMITED, BERWICK AVENUE, SLOUGH



ISSUED BY THE MECHANICAL SEALS DIVISION OF

That's right! The same people who make THE Gland Packings



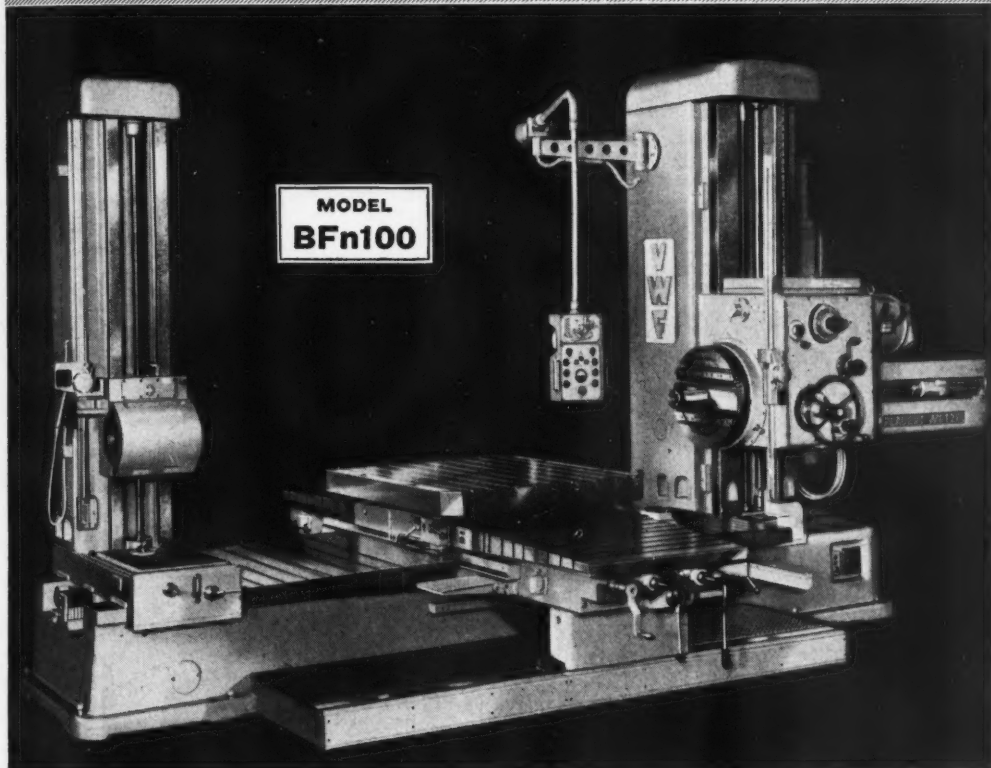
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Horizontal Boring and Milling Machine



- Boring and milling spindles can be engaged individually or together, at identical or different speeds.
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Brief description Model BF n 100

Table dimensions	50 in. x 55 in.
Table load, max.	8 tons
Distance between faceplate and steady	124 in.
Height of work spindle above table	0-55 in.
Cross and longitudinal traverse of table	69 in.
Boring spindle diameter	3.94 in.
Milling spindle diameter	7.09 in.
Boring depth in one traverse/with resetting	35/49 in.
Maximum diameter bored	35 in.
Facing diameter, max.	44 in.
Spindle speeds	9-1400 r.p.m.
Rapid traverse (all directions)	138 in./min.
Main motor	20 HP.
Weight (net, with steady)	17 tons

other models
are available

Sole British Agents

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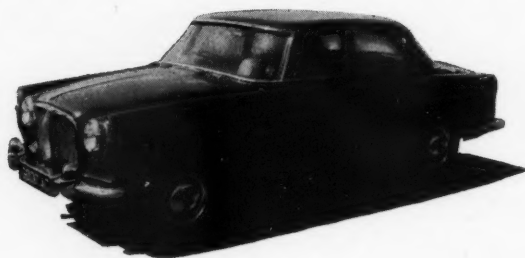
Machine Tool Co. Ltd

Hythe Works, The Hythe
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AJAX

AJ31 RADIAL

for
Rover
3 litre
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production

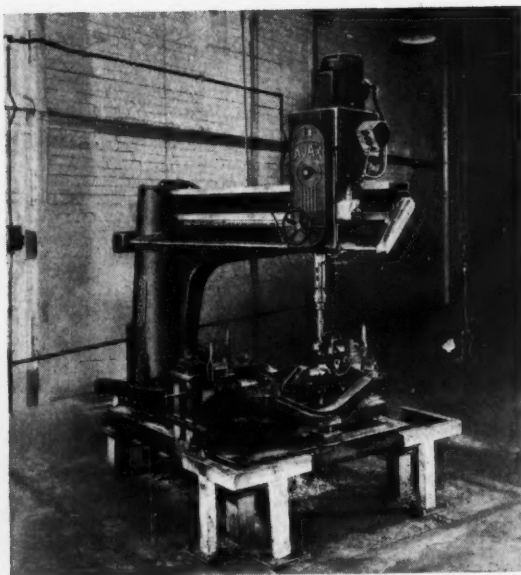


It is significant that the Rover Co. Ltd., one of the manufacturers of Britain's finest cars, has chosen AJAX AJ31 Drills to assist in the production of their superb 3 litre car. They are used for jig drilling and spot facing engine sub-frames, apart from many other machining operations — once again AJAX RELIABILITY — predominates.

BRIEF SPECIFICATION

- * 3" drilling capacity in steel
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- * Spindle No. 5 M.T.
- * 8 spindle speeds
- * Choice of 3 speed ranges

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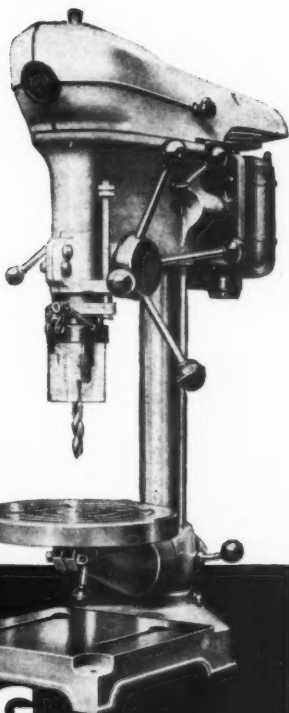
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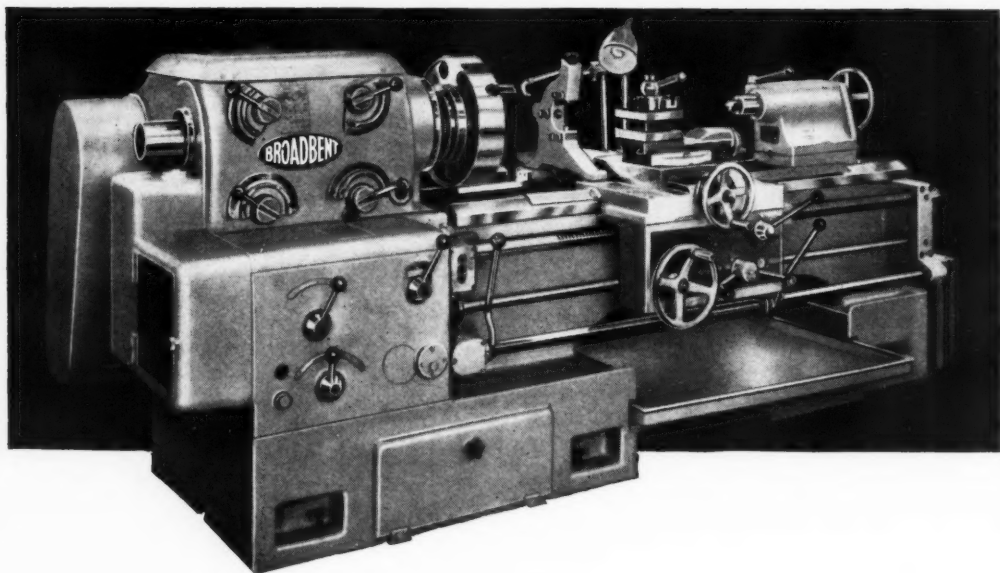
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Good men plus good tools equal good output. Every Broadbent lathe incorporates almost a century of machine tool building. Manufacturers know that for versatility, accuracy and reliability there is nothing quite as good as a Broadbent Machine Tool.

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LATHES



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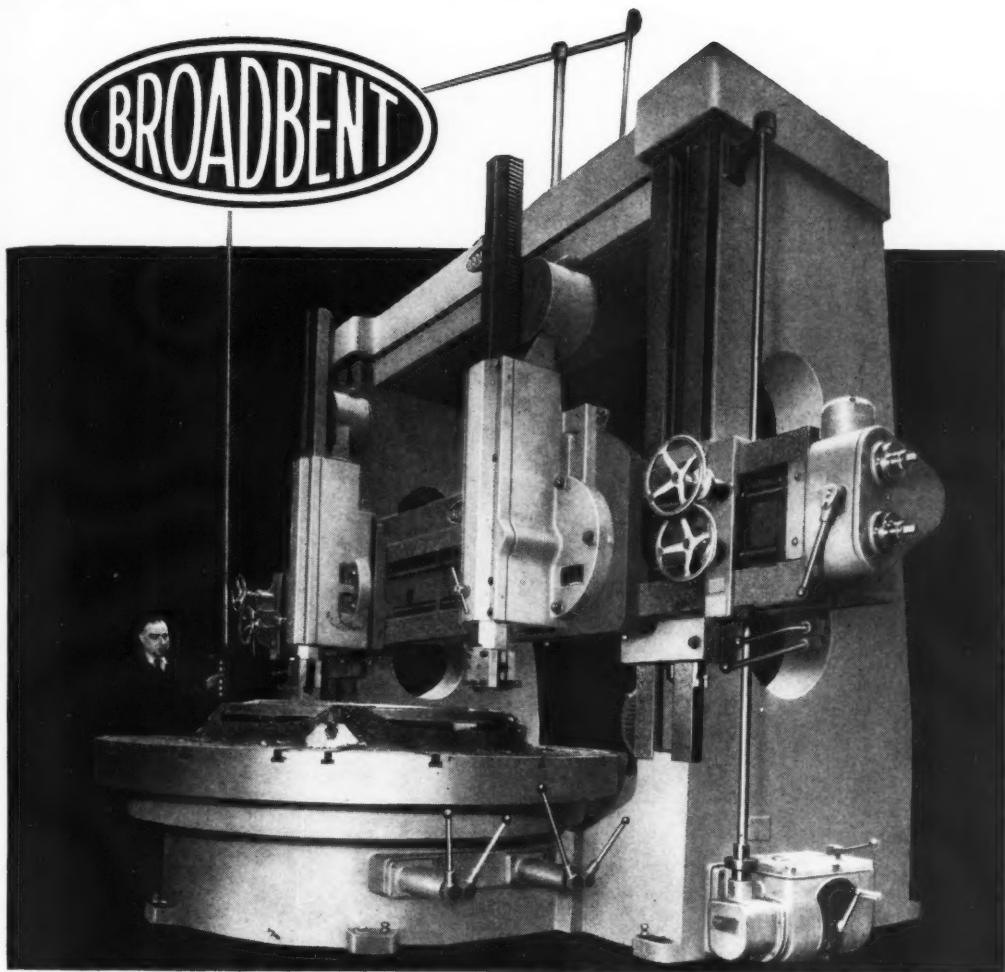
The Broadbent range of Machine Tools includes Surfacing and Screw-cutting Lathes from 17" to 72" swing, Surfacing and Boring Lathes, Break Lathes, Crankshaft Lathes and vertical Turning and Boring Mills with 5', 6', 8' or 10' capacity.



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Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611
Broadway/H89



HEAVY DUTY Vertical BORING & TURNING MILLS

with 5, 6, 8 or 10 ft diameter work tables

These incomparable machines are massively constructed for years of hard service. Accuracy and dependability are of the high order that industry has learned to expect of Broadbent Machine Tools. Notable features of these Boring and Turning Mills include twelve changes of speed and six changes of feed, controllable from either side of the machine; spiral bevel and spur reduction gears driving the work table; pendant control of rams and cross slides; and rapid power traverse with independent control of the two heads.

Please write for fully illustrated brochure.



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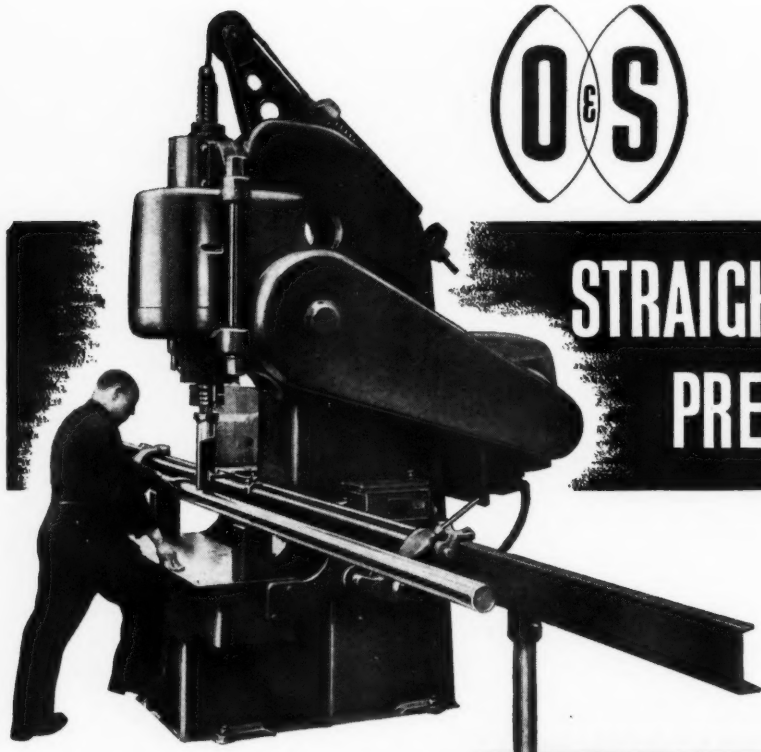
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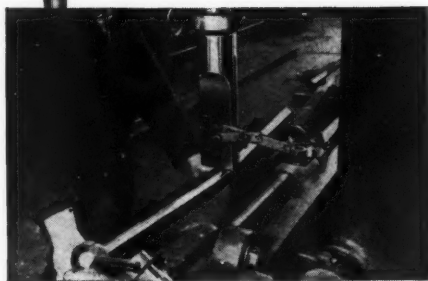
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STRAIGHTENING PRESSES



O & S Straightening Presses, made in 5 sizes with capacities ranging from 4 to 60 tons pressure, have for many years been the first choice of engineering firms throughout the world, including most of the leading motor manufacturers. For speed, accuracy and ease of operation, O & S Straightening Presses are in a class of their own.



In the Leicester works of Frederick Parker Ltd., O & S Straightening Presses are in daily service ensuring that steel shafts are perfectly straight and true.



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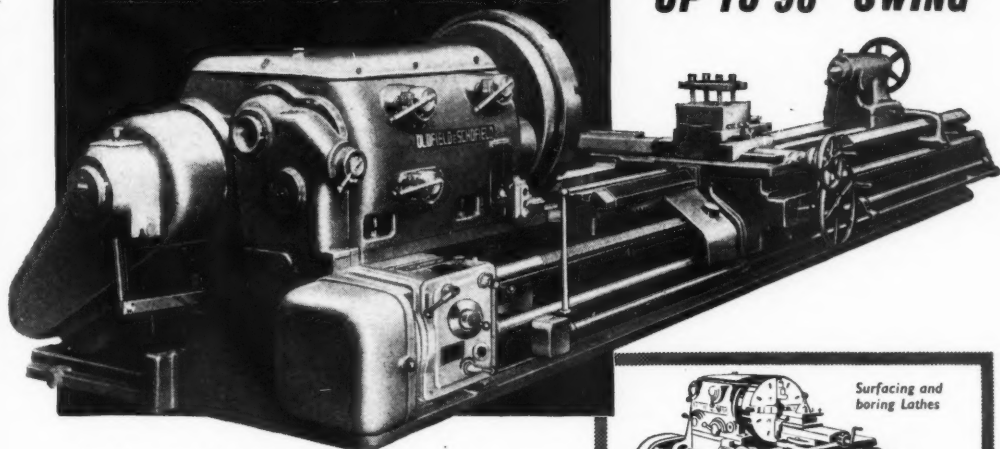
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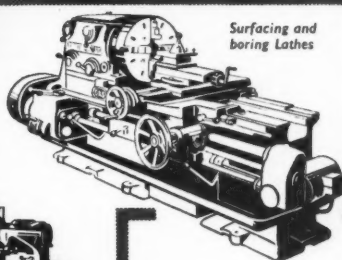
Heavy Duty LATHES



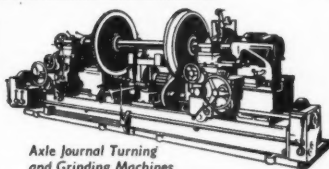
UP TO 96" SWING



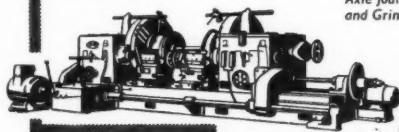
18½" Centre 'D' Type Lathes. Built in sizes up to 48" swing.



Surfacing and boring Lathes



Axle Journal Turning and Grinding Machines



Heavy Duty Double Wheel Lathe

O & S have for many years manufactured a wide variety of heavy lathes which have earned for the

company a fine reputation for precision engineering and first class craftsmanship. The range includes Surfacing and Boring Lathes up to 96" swing, Brake Lathes, Axle Lathes, railway carriage and waggon wheel lathes, axle journal turning and burnishing lathes etc., all embodying the latest developments in modern lathe design.



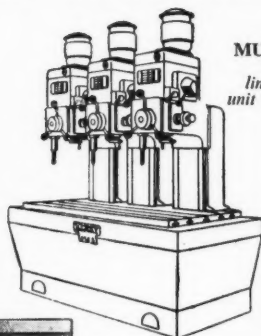
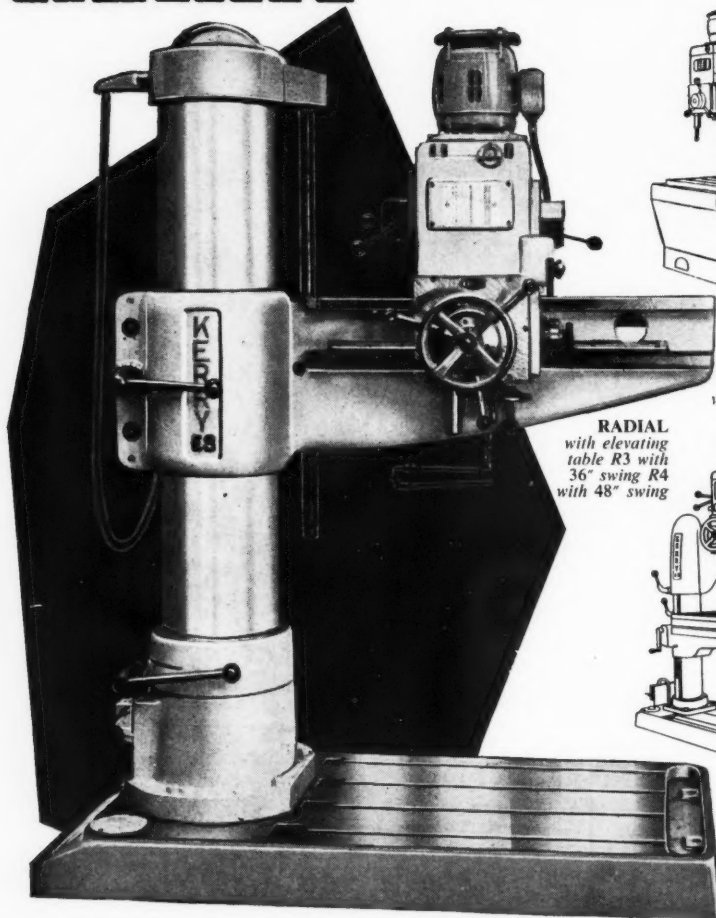
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KERRY

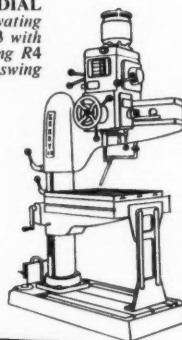
RANGE OF DRILLING MACHINES



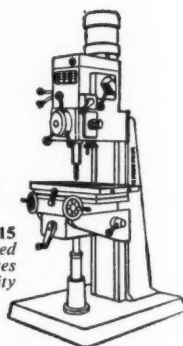
**MULTI-HEAD
MS 3**
*line production
unit 1½" capacity*

TYPE 150 AG
*all geared head also
150 IV infinitely
variable 1½" capacity*

RADIAL
*with elevating
table R3 with
36" swing R4
with 48" swing*



TYPE C15
*three-speed
ranges
1½" capacity*



Full details from
your Machine
Tool Merchant
or our
Sales Office

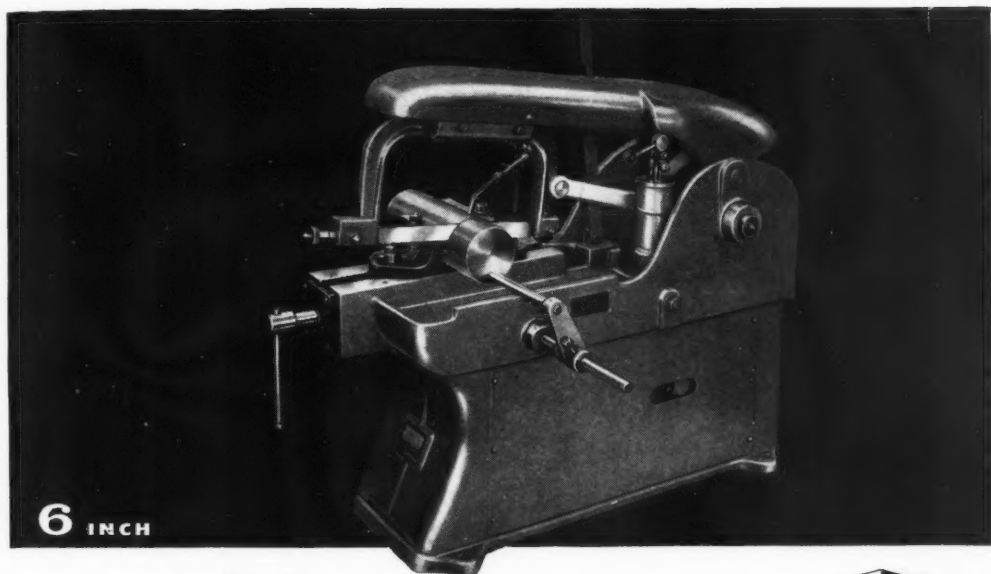
This Kerry Radial Drill type E (main illustration) is a 1½" capacity machine with many fine features. The E3 has a 46" swing and the E4, a 58" swing, drilling 37" and 49" out from column base respectively. Both models have nine spindle speeds, quick hand traverse, fine hand feed and three rates of power feed. The massive 2 member-column solid base, and heavy rigid box section arm are all well ribbed to fully withstand stress. The wide Kerry range also includes bench, pillar and line production models.



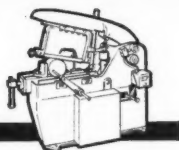
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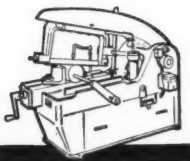
Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611
Broadway Q510



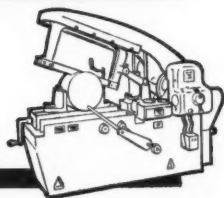
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merchant or
our Sales Office

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SAWMASTERS

**are the finest
HEAVY DUTY HACKSAWS
in the world**

Modern in design, robust and precise in construction, these unrivalled machine saws cut accurately and rapidly, and offer maximum production efficiency. Refinements include totally enclosed drive, hydraulic relief on the return stroke and automatic lifting of the bowslide to loading position on completion of cut.

Instant lever selection of correct cutting speed is a feature of all but the smallest model.

—and the famous SAWMASTER Autocut Power Bandsaw.



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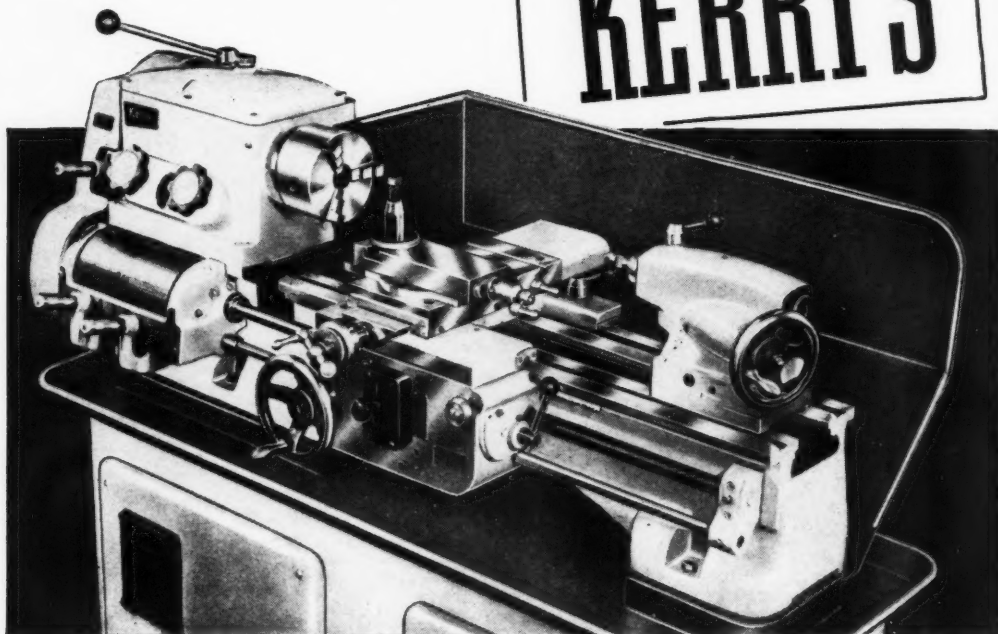
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*THOUSANDS in use in Great Britain
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- ★ SLIDING, SURFACING AND SCREWCUTTING LATHE
- ★ ALL GEARED HEADSTOCK GIVING 9 SPEEDS RANGING FROM 39-1500 r.p.m.
- ★ TYPE LOO PRECISION TAPERED SPINDLE NOSE
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- ★ BEDWAYS AND SLIDES PRECISION GROUND
- ★ HARDENED BEDWAYS OPTIONAL EXTRA

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Three point

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gear

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LONDON

It's worth going to the other end of the country — to the other end of the world! — for David Brown gears. But happily you don't have to. In addition to their headquarters in Huddersfield, David Brown have factories in Coventry and London. Each of these Divisions offers a first class service in gear production.

Whether you're nearest to Huddersfield, Coventry or London you get the benefit of the immense resources of the whole David Brown organization. If you're not already a D.B. customer, get in touch with your nearest factory right away — and learn for yourself what they can do!

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100 YEARS
THE GEAR INDUSTRY
 1860-1960

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COVENTRY GEAR DIVISION

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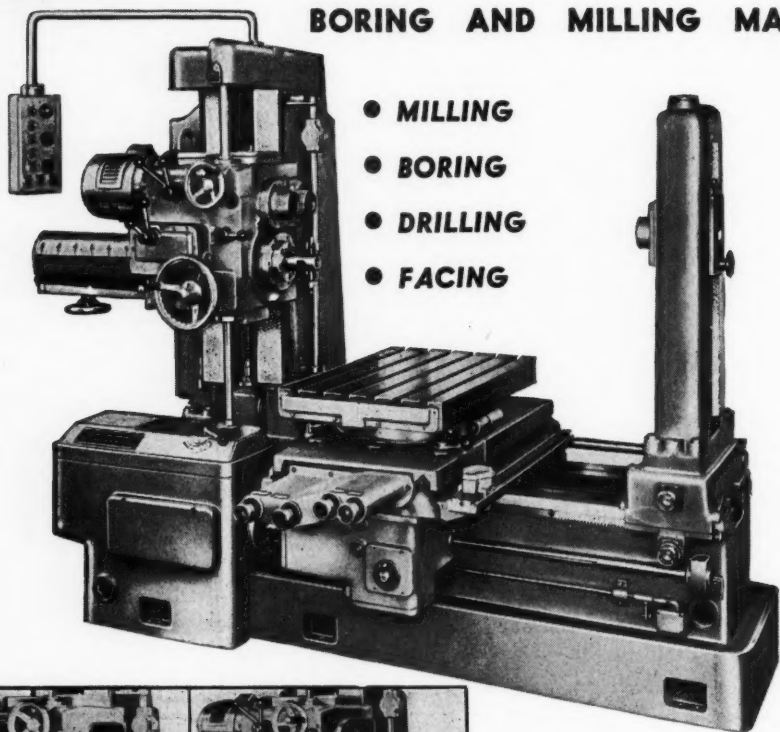
Stonebridge Park Works,

N. Circular Rd., N.W.10 Tel: ELGar 6824

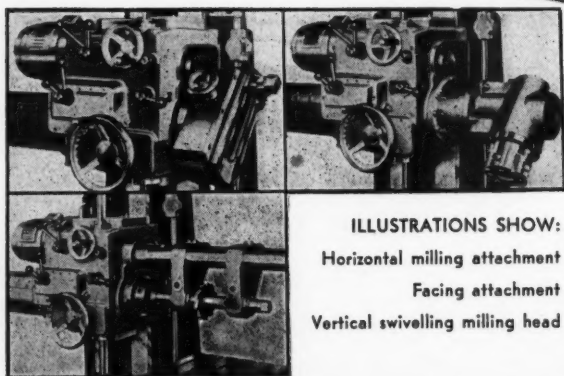
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GATE**LA.60***Multi-Purpose***BORING AND MILLING MACHINE**

- MILLING
- BORING
- DRILLING
- FACING



ILLUSTRATIONS SHOW:
 Horizontal milling attachment
 Facing attachment
 Vertical swivelling milling head

Spindle diameter 2½"

Table 31½" x 21"

Maximum traverses: longitudinal 30".
 cross 30", vertical 19½"

Spindle speeds (12) 28-1300 r.p.m.

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GATE MACHINERY CO. LTD

172-178 VICTORIA ROAD · ACTON · LONDON W 3
 TEL: ACORN 8881/2 TELEX: 21111

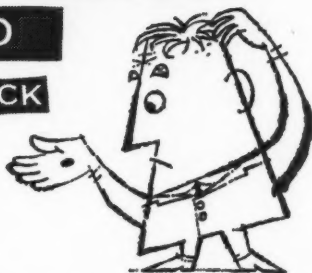
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THEY COME

THE HARDER

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Small parts *are* fiddley to pack properly. But there's a new, low-cost answer to the problem. Aluminium Foil. Venesta Foils' strip makes a snug, damage-proof pack for any shape of product. A pack hermetically sealed against corrosion and dust.

It means easier counting and stock handling.

It means you can pack in sets, ready for assembly.

It gives you handy packs that sell your product.

And at low cost? Yes, because you save labour—packing is just one simple, fully mechanised operation.

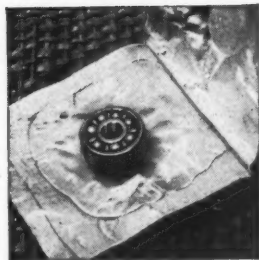
Put Foil's Top Team to work for you

Ask about strip Packaging by

VENESTA FOILS LIMITED

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This is the latest development in the range of LUMSDEN Reciprocating Table Machines. Its design

retains the double column support for the bridge, but the columns have been angled to provide easier access to the table. Other improvements to be found on TYPE 71 MLOD include an improved feed arrangement for the wheel and the incorporation of power elevation for rapid movement of the grinding head. Hydraulic controls of new design have been repositioned to give easier operation. Lubrication of the entire machine is fully automatic, with special provision for the table ways which now have 100 per cent. protection. The spindle motor is mounted inside the bridge, from which new position its drive is transmitted to the spindle through a Power Grip belt.

Control equipment for the motors is now housed within the column and the push button station, which includes controls and signals for the magnetic chuck, is mounted within easy reach of the operator. Both rectifier and transformer supplying the magnetic chuck are built into the machine bed. A further improvement to the table splash guard is the provision of sliding doors, which makes for easier operation. These are a few of the improvements incorporated in the new TYPE 71 MLOD; should you require further information please do not hesitate to call on us.

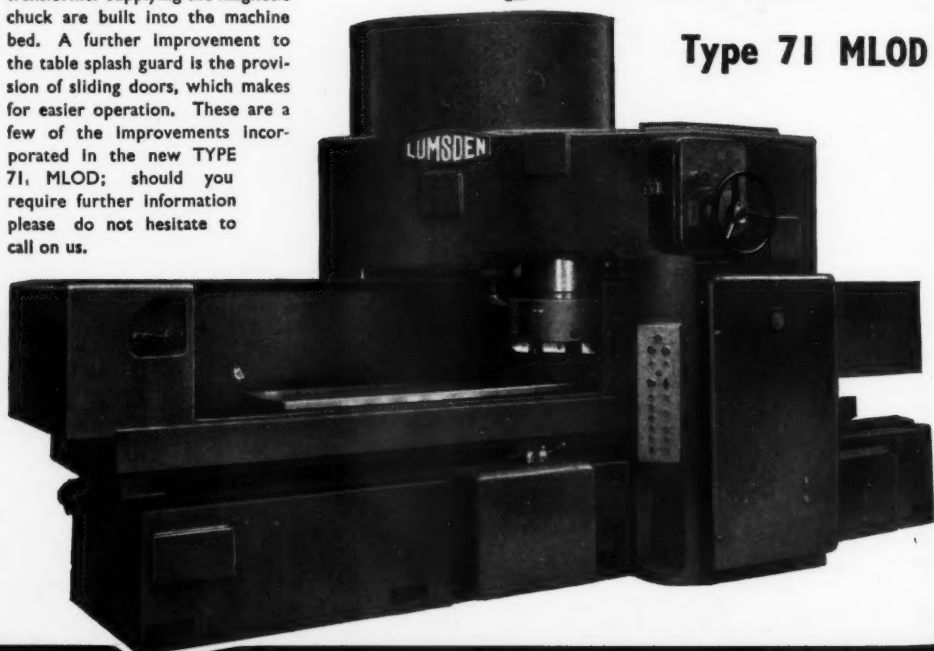
The Latest

LUMSDEN

Reciprocating Table

SURFACE GRINDER

Type 71 MLOD



THE LUMSDEN MACHINE CO. LTD. GATESHEAD, ENGLAND

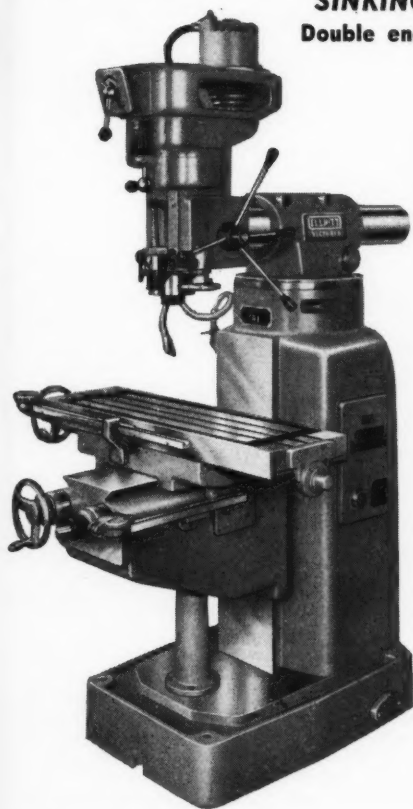
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ELLIOTT VICTORIA

TURRET MILLING MACHINES

**MODELS TR1, TV1 & TV2 for MILLING • DRILLING • BORING • DIE
SINKING • END MILLING • KEYWAY CUTTING**
Double ended overarm now standard on Models TV1 & TV2

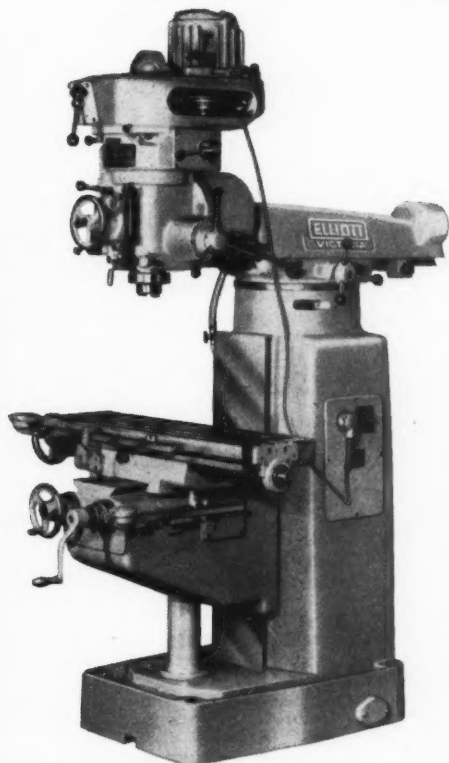


Model TR1 TABLE SIZE 36" x 10½"

5" dia. round overarm, rotated for angular setting of the head.

Rugged base casting, precision ground bearing areas.

Head powered by 1½ h.p. motor.



Model TV2 TABLE SIZE 36" x 10½"

Similar to model TR1 but fitted with heavier type head, powered by 1½ h.p. motor. Longitudinal power feed unit, motorised slotting attachment and motorised punch shaping and slotting attachment, available as extra equipment.

Manufactured by:

B.ELLIOTT (MACHINERY) LTD

(MEMBER of the B. ELLIOTT GROUP)

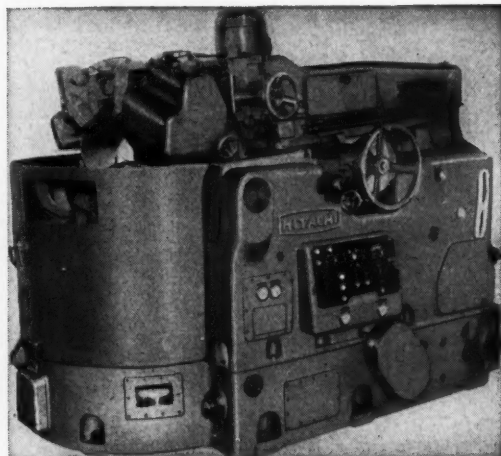
VICTORIA WORKS • WILLESDEN • LONDON • N.W.10
Tel: ELGAR 4050 (14 lines) Grams: Ellietana, Harles, London
Overseas Subsidiaries CANADA • U.S.A. • AUSTRALIA • S. AFRICA



NRP 2714

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Efficiency *plus* **HITACHI** Bevel Gear Grinder



HITACHI Bevel Gear Grinder Type 600 BG-1

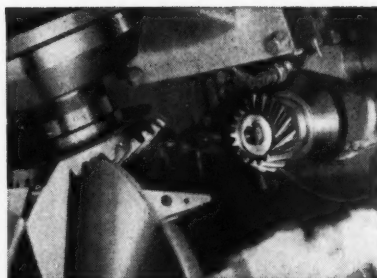
Characteristics:

The HITACHI bevel gear grinder, Type 600 BG-1, has been designed on an entirely new principle of generating method, and is credited with the following features:—

1. The machine can be operated with utmost ease.
2. Crowning is possible even in the direction of gear teeth.
3. The same grinding wheel can be used irrespective of dimensions, helix angles, pressure angles of the bevel gears to be processed.
4. Meshing tests can be conducted without removing the processed gear.

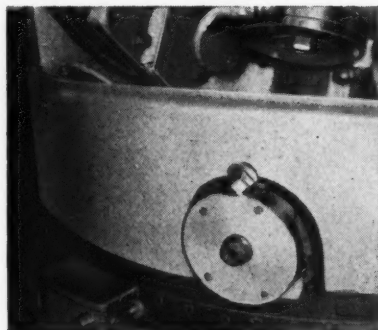
Specifications:

Max. pitch dia.	...	...	...	610 mm.
Min. pitch dia.	...	...	...	50 mm.
Largest cone distance	...	...	...	305 mm.
Pressure angle	...	...	...	14½°—20°
Max. helix angle	...	...	...	35°
Module	...	...	...	2.5M—8M
Dia. of grinding wheel	...	...	...	400 mm.
Main Motor	...	...	...	5 h.p.
Size of Machine	2,765 mm.	x	2,000 mm.	x 1,850 mm.
Net Weight	...	...	...	approx. 11,00 kg.



WORK HEAD

The photo shows that a set of gear and pinion is fitted on each work head.



DIAL FOR AUTOMATIC SETTING

The table constructed in the two-stage type, and is provided with a screw for parallel slide and a dial.

Patents on this grinder:—

Patents have been applied for in the United States, Britain, Germany Switzerland and Italy, in addition to those already taken out in Japan.

Other HITACHI products include:—

Gear hobbing machines
Knee-type milling machines
Surface grinders
Roll lathes and grinders
Railway car wheel lathes
Axle journal returning and burnishing lathes
Transfer machines, etc.

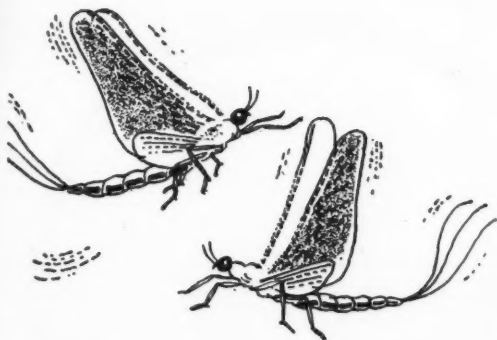


Hitachi, Ltd.

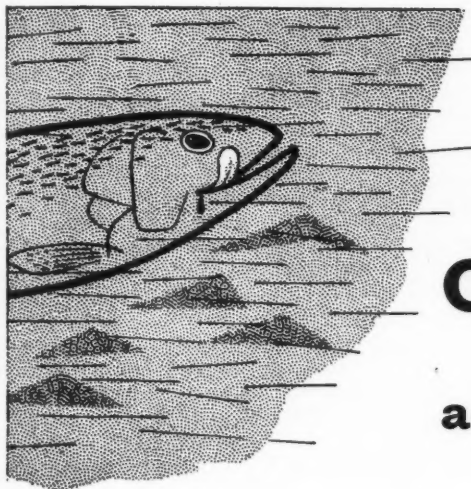
Tokyo Japan

Cable Address: "HITACHI" TOKYO

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FONDU CONCRETE

achieves its object

Remember—for most purposes concrete made with CIMENT FONDU is ready for use 12 to 15 hours after placing, and at 24 HOURS it is stronger than other concretes 90 DAYS old. Also, used with suitable aggregates, CIMENT FONDU produces Refractory and Insulating concretes of the very highest quality.

For machine foundations, floor, road and factory entrance repairs and renewals CIMENT FONDU is unequalled. CIMENT FONDU

can save you time and money on your concrete work by eliminating waiting time.

Let us send you our 32-page booklet "THE CEMENT FOR INDUSTRY".

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FOR SPEED • STRENGTH • RESISTANCE • REFRACTORINESS

LAFARGE ALUMINOUS CEMENT CO. LTD. 73 Brook Street, London, W.1. Tel: MAYfair 8546

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THAT MAKES
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OBSOLETE**

TECALEMIT

**HIGH PRESSURE
NYLON HOSE**

Following in the great pioneering tradition of their extruded nylon tubing, Tecalemit now proudly present a new High Pressure Hose—equalling those precision limits of Tecalemit Nylon Tubing already so well known to industry.

Tecalemit High Pressure Nylon Hose consists of:

A precision extruded flexible nylon core tube

High tenacity braiding

An outer sheath of flexible nylon tube

This structure gives the hose its characteristic pliability, with minimum inside bend radii of from 1½" to 4", according to size. Tecalemit High Pressure Nylon Hose has these advantages:

**Greater durability · Longer life · Ease of assembly
Re-usable end fittings · Clean finish and appearance
Greatly reduced wall thickness—therefore far smaller external
diameters and much lighter complete assemblies.
And all at highly competitive prices.**

If you wish to substantiate these claims, Tecalemit will provide sample standard lengths of hose assembled with common forms of coupling, so that test rigs can be undertaken. Tecalemit High Pressure Hose is supplied in five sizes ½", ¾", 1", 1½" and 2" internal diameter, to meet the needs of industry for hydraulic and pneumatic systems. Write for full technical details of Tecalemit High Pressure Nylon Hoses and their use on hydraulic and pneumatic systems for:—

**Agricultural Machinery · Earth-moving Plant
Mechanical Handling Plant · Machine Tools**



TECALEMIT

LIMITED (SALES MY)
PLYMOUTH DEVON

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MONARCH'S*New Model***K****'Kompact' Lathe**

A New opportunity to obtain a 'MONARCH QUALITY' Lathe...

This new S.S. and S.C. Lathe is built to Monarch's usual exacting standards and incorporates many features usually found only on larger machines. The in-built accuracy of this Lathe coupled with its robust construction makes it ideal for both toolroom and production work.

Each feature of the machine has been proved in the field and is based on Monarch's 50 years' experience in building precision lathes.



- * Flame hardened and ground bed ways
- * Spindle mounted in precision taper roller bearings
- * Wide ranges of speeds, feeds and threads
- * Apron control for spindle clutch and brake
- * All-gear headstock with constant mesh helical gears
- * Automatic lubrication systems

BRIEF SPECIFICATION

Height of centres	8"
Distance between centres ..	54"
Swing over cross slide	10"
Spindle speeds (16)	28 — 1200 r.p.m.
Feeds (48)	0.0012 — 0.070 ins/rev
Thread range	1½ — 92 t.p.i.
Motor	5 h.p.

EARLY DELIVERY

ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write or telephone TODAY

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

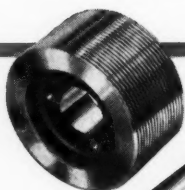
ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 • STOCKPORT—TEL: STOCKPORT 5241 • GLASGOW—TEL: MERRYLEE 2822



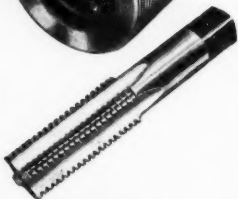
Thread Grinding Machines

save money on parts like these

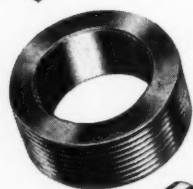
Screw Plug Gauge
2 3/4" dia. x 11 T.P.I. x 2 1/4"
Whitworth Form



High Speed Steel Tap
1" x 8 T.P.I. x 2 1/4"
Whitworth Tap
Limits BS949
Grinding Time 80 secs.



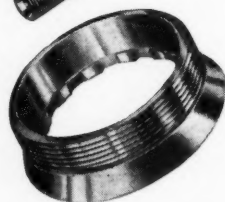
Thread Crushing Roller
3" dia. x 8 T.P.I. x 1 1/2"
American Form



Micrometer Screw
10mm. x 0.5mm. x 40mm.
long, S.I. Form
Grinding Time 6 mins.



Internal Combustion
Engine Valve Seat
1 1/2" dia. x 20 T.P.I. x 5/8"
Whitworth Form
Grinding Time 50 secs.



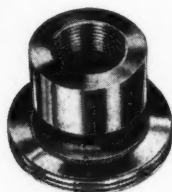
The various 'MATRIX' Models represent the world's widest range of Thread Grinding Machines.

They will accommodate a range of work extending from the finest threads used in precision instrument manufacture up to a maximum capacity of 24" diameter by 90" long.

The machines embody the latest advances in toolroom and production thread grinding technique and are based on many years of research and development.



Steering Worm
26mm. x 6mm.
x 66mm. long
L.H. Worm Form
Grinding Time 3 mins.



Internal Threaded
Component
1 1/2" dia. x 16 T.P.I.
Unified Form 1/2" long
Grinding Time 4 mins.



Screw Plug Gauge
1 1/2" dia. x 4 T.P.I.
x 2" long.
Acme Form.

ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write or telephone TODAY

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

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ANALYSIS OF THE

U.S. ECONOMY

June

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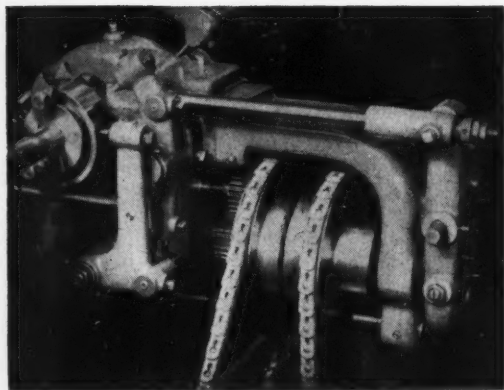
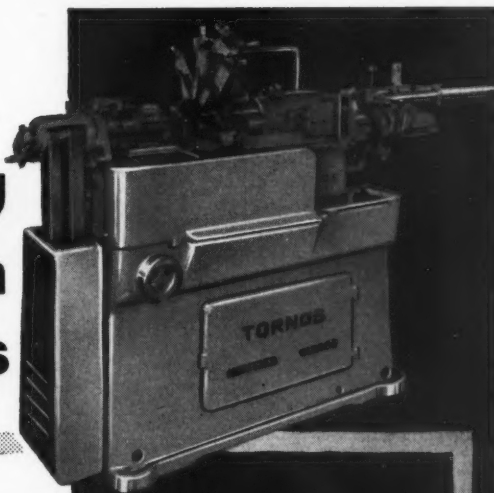


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to

outstanding design features



ACCELERATOR

This is used for speeding up the idle movement times of the Camshaft thus increasing production and efficiency. It is of the silent clutch type with instantaneous engagement and disengagement. Production can be increased by up to 50% depending on requirements.

Ask for Brochure

** Gives*

TORNOS

SLIDING HEAD AUTOS

unsurpassed
versatility
and
productive
capacity

TORNOS AUTOMATICS

Include the following sizes:

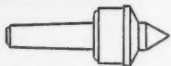
MODEL	MAX. DIA. BAR
M4	5/32 ins.
M7	9/32 ins.
R10	15/32 ins.
R16	5/8 ins.
RR20	25/32 ins.
MR28	1.3/32 ins.
MR32	1.1/4 ins.

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The finest tools of their kind

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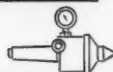
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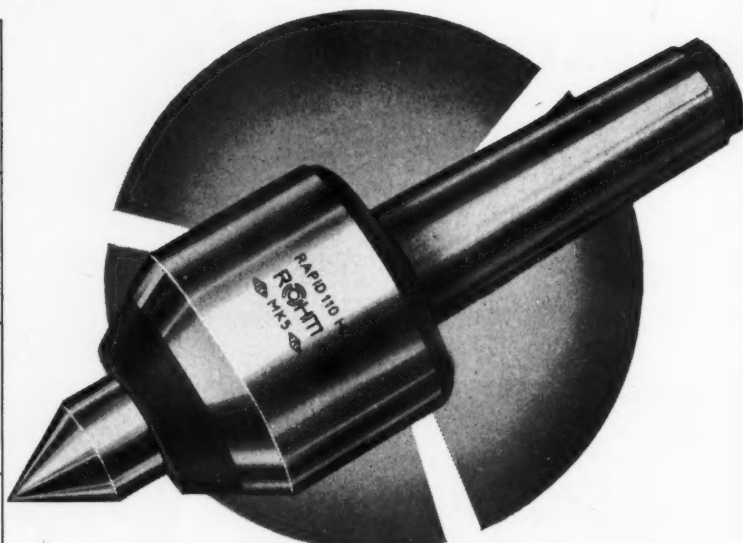


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REVOLVING CENTRES

** a type and size for EVERY duty*

Whatever your requirements in revolving centres there is a type and size in the ROHM range exactly to meet your needs. Each and every type has been specifically designed to ensure the highest possible performance. Ask for further details.



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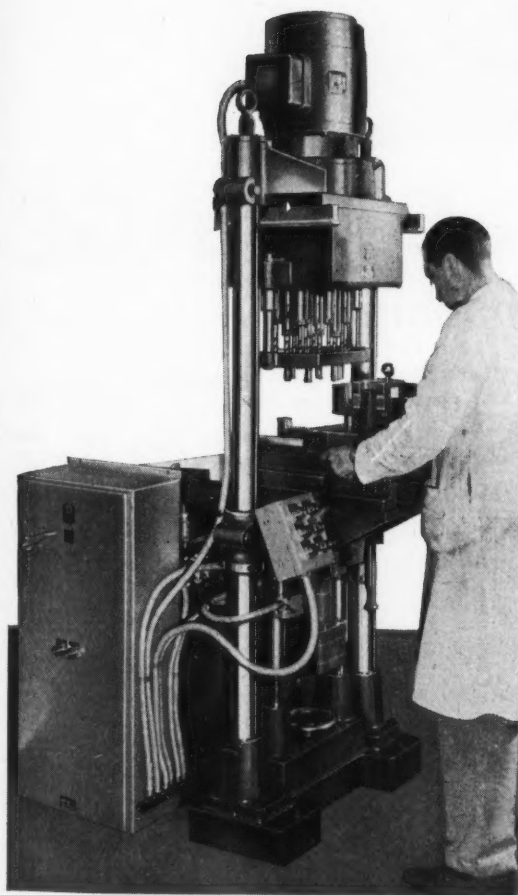
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These hydraulic up-stroking multi-spindle drilling machines provide fast approach, accurately controlled drilling feed and fast return of the worktable after completion of drilling. They are extremely flexible in use and can be fitted with driving motors of up to 15 h.p. — the thrust available from standard machines can be varied up to 8,000 lbs.

The machine illustrated is one of two recently supplied to a customer for the quantity production of Brake components. Provision is made for fast changeover of multi-spindle Heads and tooling, and the machines were supplied complete with all necessary jigs and fixtures built to customer's requirements.

'Patterning' of multi-spindles enables one machine to cater for a number of different parts — Heads with up to 90 spindles are in course of production.

A complete range of fixed centre and adjustable type multi-spindle Heads for attachment to existing machines, together with a comprehensive tooling service are also available.

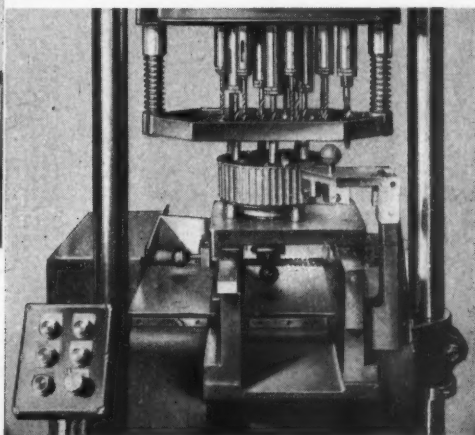


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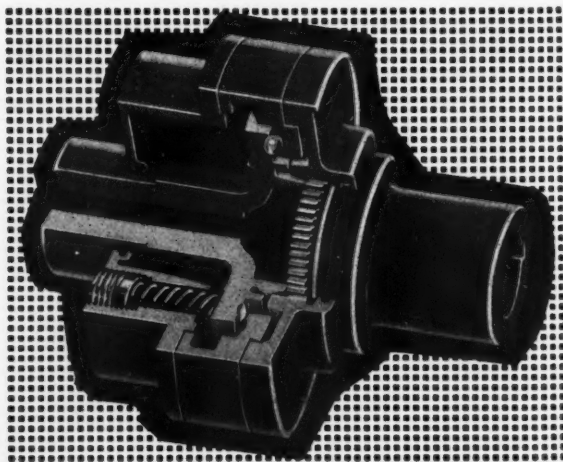
PREVENT DAMAGE

to your machinery

A.S. TORQUE LIMITING SAFETY COUPLING

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PATENTED PRODUCT

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NEW Besco Model EZ Power Eccentric Punching Presses

Two Models ex stock

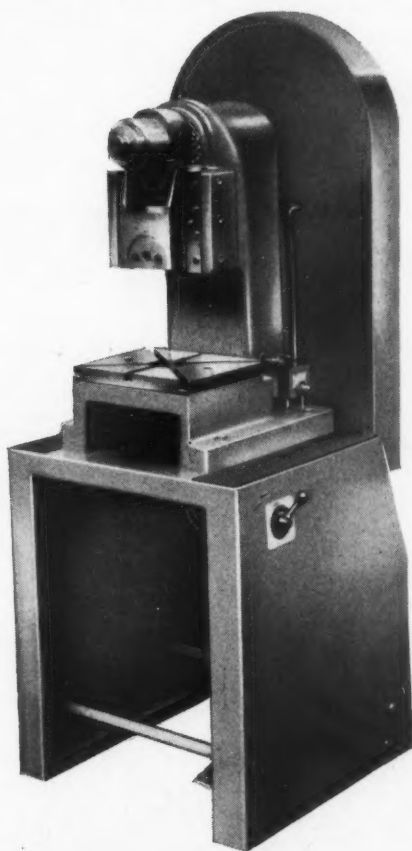
Strong, reliable presses, built to stand up to a heavy workload, with a well ribbed cast iron body, and long ram slides to give extra life to the tools. The crankshaft is of generous diameter, and made from high tensile heat treated carbon steel.

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These are offered subject to prior sale

Model No.	E.Z.5	E.Z.8
Pressure, tons	5	8
Stroke adjustment	0"-1.29/32"	0"-1.29/32"

*Excellent terms, monthly account,
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Hire Plan*



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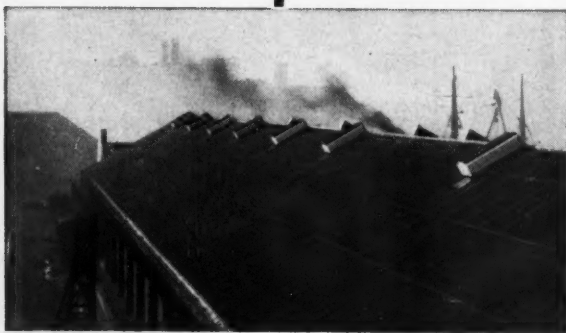
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Ventilation

Place:

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Exhaust gases from fork lift trucks and lorries were once a major problem in this storage shed. Colt experts were called in to make a scientific analysis and on their recommendation a series of Colt S.R.C./3080 High Duty Extract Ventilators was installed. Fumes no longer bother anyone.

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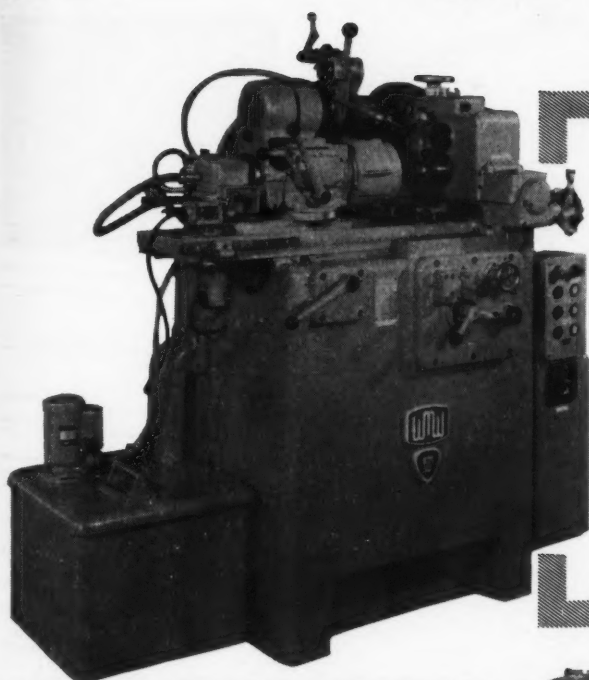
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MIDL
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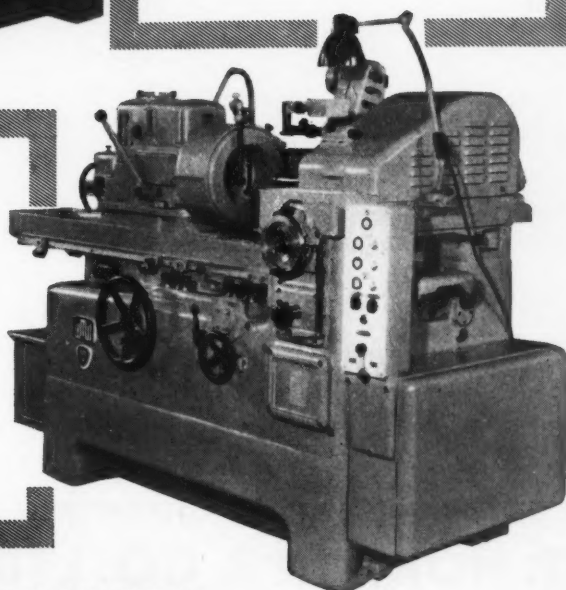
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Model SI.40 x 70

Capacity $\frac{5}{32}$ " — $1\frac{9}{16}$ "
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Capacity 1" — $4\frac{1}{8}$ " x
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*Guaranteed
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We hold large stocks of non-standard sizes and Round Stock 1/4in. to 2 1/2in. dia.

**30,000 LENGTHS ALWAYS
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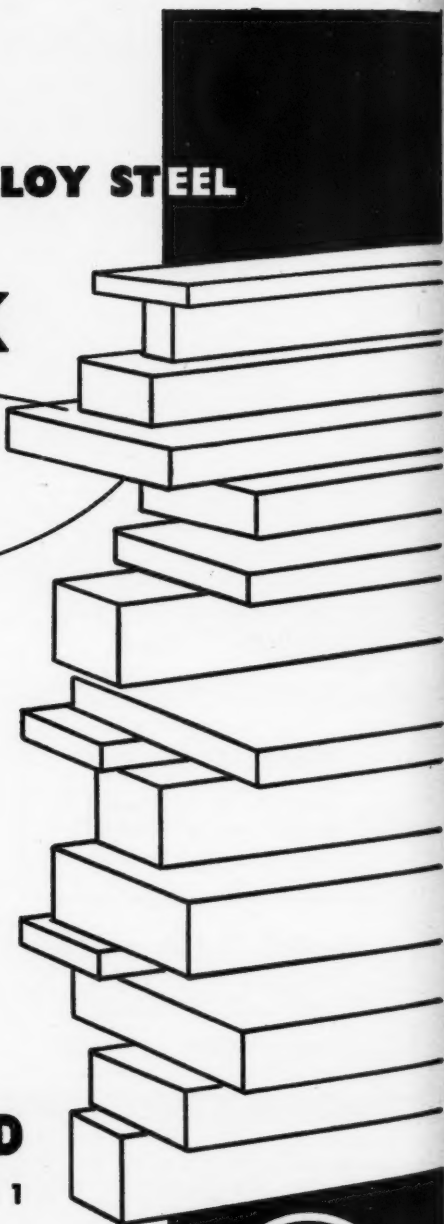
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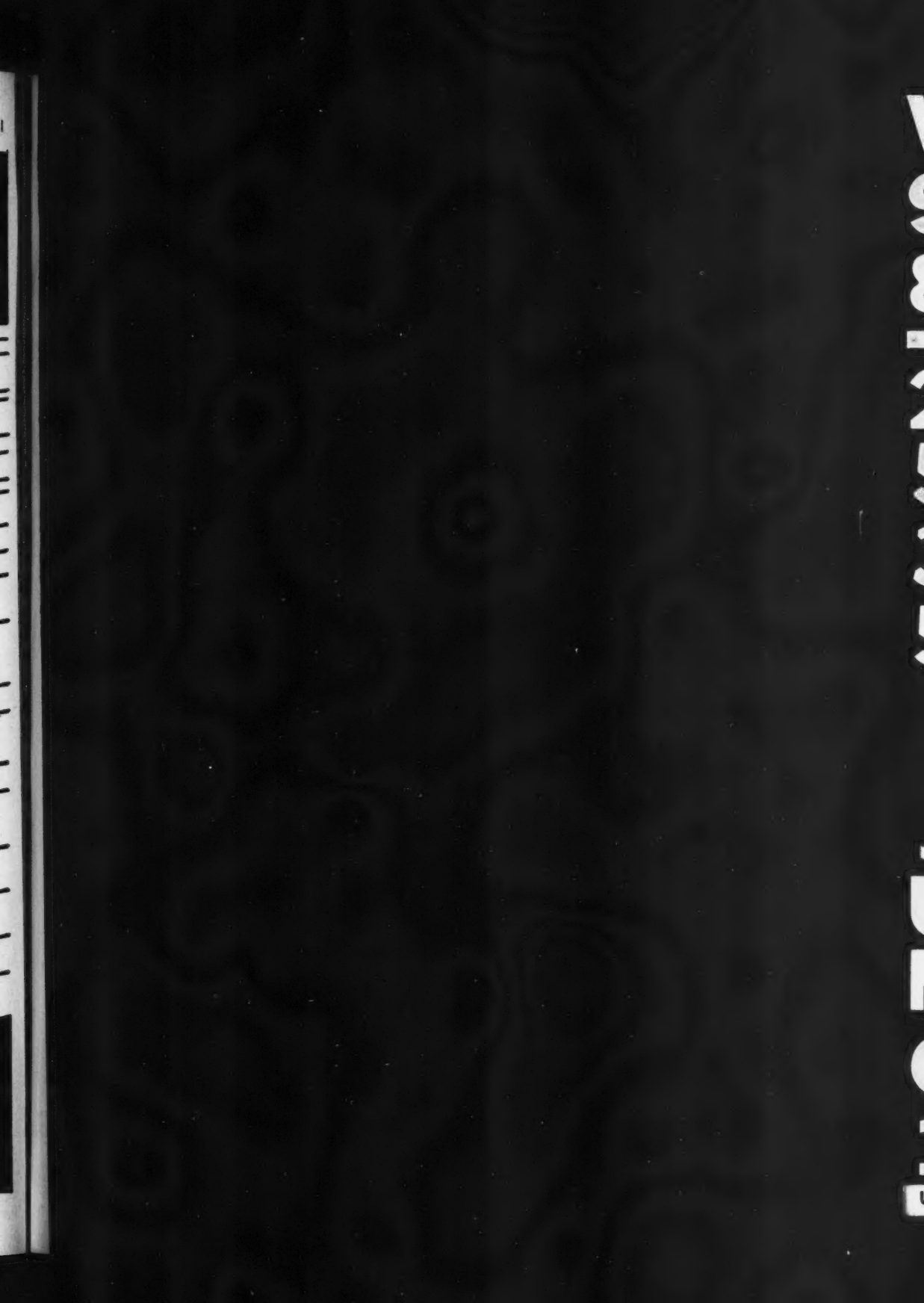
CARVER STREET

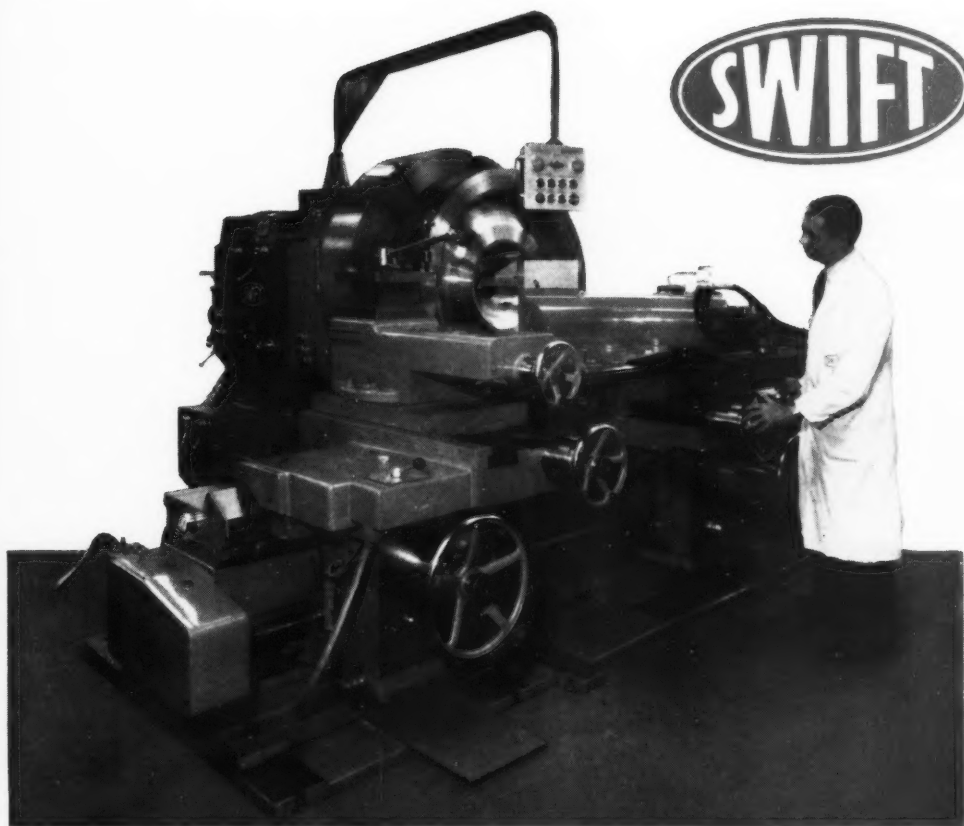
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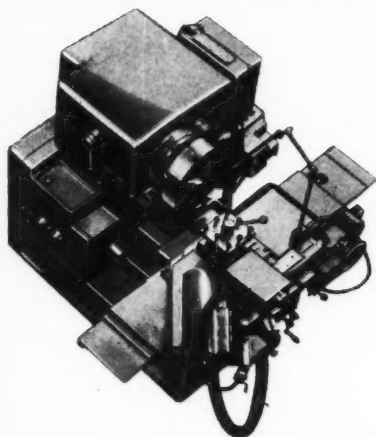




FACE COPYING LATHES

The lathe shown above accommodates work up to 60in. diameter. 18 Mechanical speed changes are provided and a 40 h.p. D.C. motor, with 6:1 infinitely variable range provides power via a Ward Leonard set. Overall spindle speeds, 1 to 120 r.p.m. Two saddles are fitted and the right-hand saddle has a swivel type hydraulic copying unit. Motor speed can be controlled from either saddle by selector switch to give constant cutting speed across the face of the workpiece.

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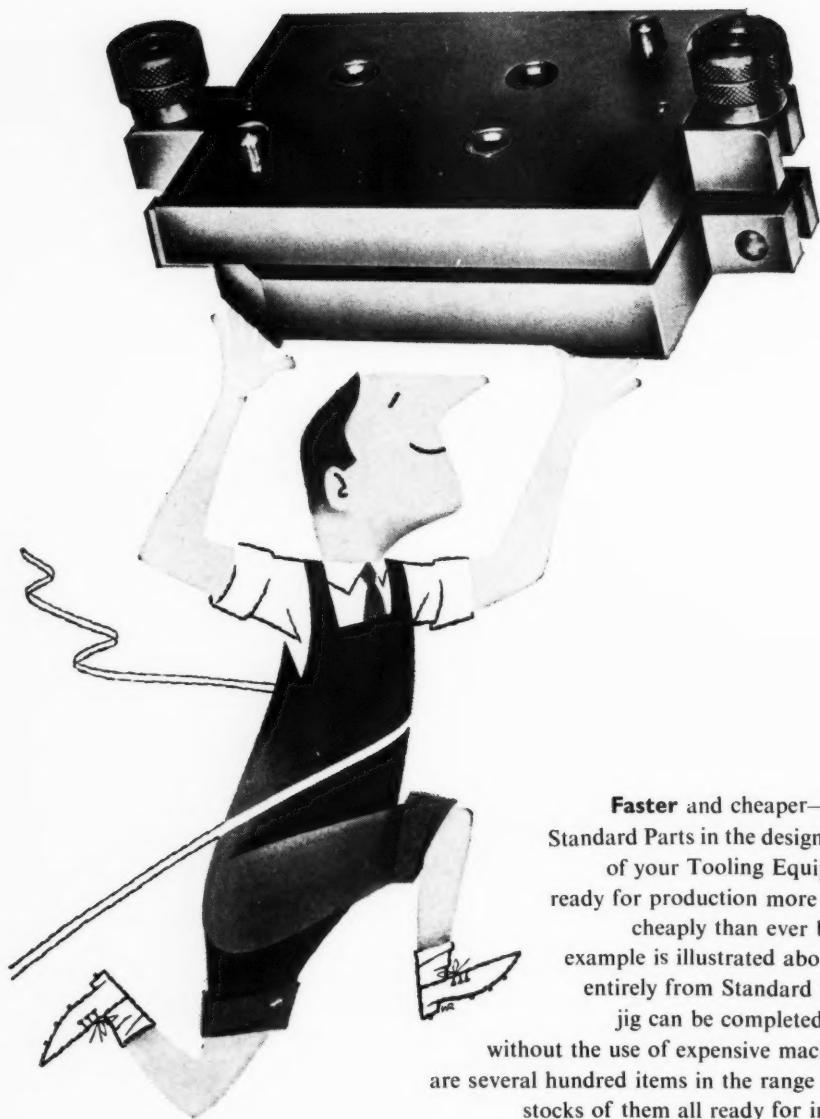
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Faster and cheaper—by using Purefoy Standard Parts in the design and manufacture of your Tooling Equipment you will be ready for production more quickly and more cheaply than ever before. A typical example is illustrated above. Made almost entirely from Standard Parts, this type of jig can be completed very quickly and without the use of expensive machine tools. There are several hundred items in the range and we hold large stocks of them all ready for immediate delivery

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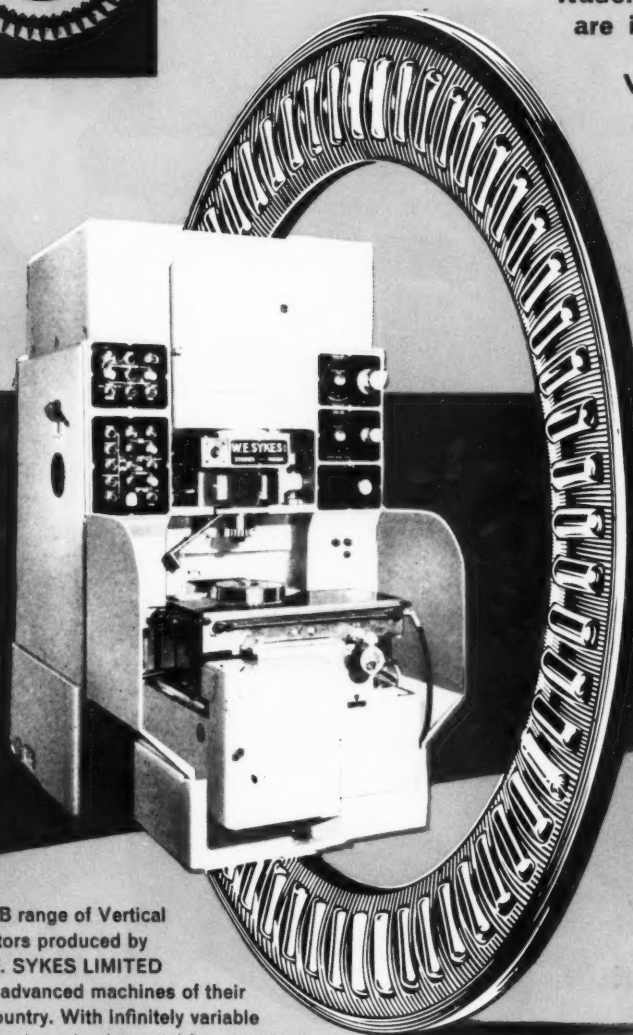
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Nadella Needle Bearings
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**VERTICAL GEAR
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The new V10B range of Vertical Gear Generators produced by Messrs. W. E. SYKES LIMITED are the most advanced machines of their kind in the country. With infinitely variable speeds and feeds and substantial functional improvements, these robust production machines are engineered for high performance and reliability. NADELLA NEEDLE BEARINGS offer the modern designer many advantages, including:—
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first and foremost in needle bearings

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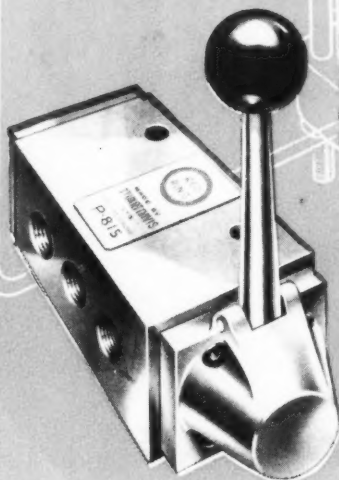
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controlling a fluid power

BY HAND
BY FOOT
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RING

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Manufactured by the Makers of Fine Machine Tools

**Stuart
DAVIS
LTD**

STONESTRIDGE HIGHWAY, WILLENHALL
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One of the most popular range of valves is this P.800 series available as lever, foot, toe, air pressure or solenoid operated. The basic valve is engineered to give the maximum number of trouble free operations, unaffected by dirt because it is self cleaning, full air flow through valve giving faster response to cylinders, and easy fixing to any machine, make this range the most versatile available. $\frac{3}{4}$ " and $\frac{1}{2}$ " BSP sizes.

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For the full range of the
Manufacturing and parts to
STUART DAVIS
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RED RING
Distributors

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Low cost automation
'CENTEC AUTOMIL'
suitable for
PENDULUM MILLING
 USING TWO FIXTURES
14 inch TRAVERSE

Stand 9215
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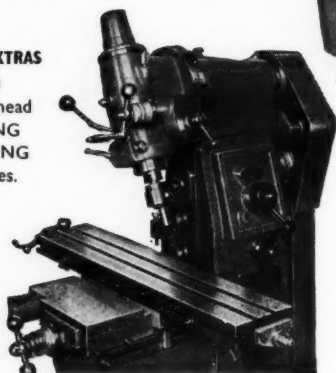
- ★ Automatic Cycle Production Milling
- ★ Climb Milling
- ★ Pendulum Milling
- ★ **SEPARATELY CONTROLLED
FEED RATES IN EACH
DIRECTION 2in.-400in. PER MINUTE**
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Table surface 27in. x 6in.

Works on standard air line pressure

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Vertical
 swivelling head
 for MILLING
 and DRILLING
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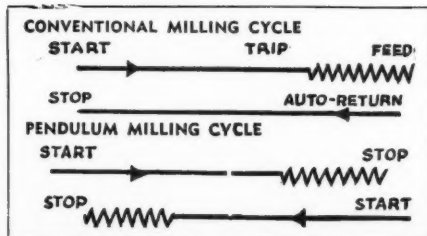


also PNEUMATIC INDEX TABLES synchronised
 for automatic milling of Squares and Hexagons

Full Details: CENTEC MACHINE TOOLS LTD.,
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SYNTRON Vibratory Small Part Feeders bring order out of chaos. From a jumbled mass the parts or products emerge in a steady stream, moving at a controlled rate. Every one is the right way round and the right way up. SYNTRON Feeders handle tough metals and fragile glass with equal security, and can cope with pieces $\frac{1}{8}$ in. or 6 in. long. They eliminate both the labour costs and the possibility of error inherent in hand feeding. Please write for Publication R 598, which gives full details.

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small part feeders

The range of Syntron Electric Vibratory Equipment includes vibrators, feeders, feeder machines and packers for use with powders, gravels and similar materials. Full details on request.

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A WHOLLY OWNED SUBSIDIARY OF
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TUNGSTEN CARBIDE ROTARY CUTTERS

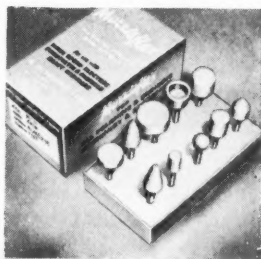
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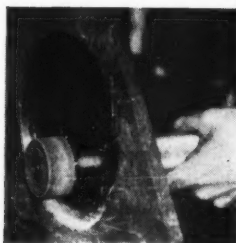
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Morrisflex Tungsten Burrs are now essential tools in the manufacture of dies, moulds, press tools, aircraft engine parts, Atomic Plant components and in many other fields where hard and difficult materials are worked: they are also particularly successful in dealing with Fibre Glass, which is notoriously damaging to conventional tools. A large range of standard burrs in Tool Steel, and HSS is also available, together with a great variety of follow up tools for grinding and polishing.



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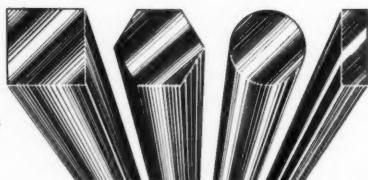
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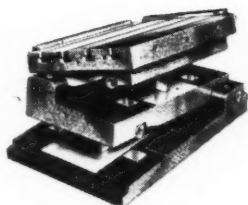
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STEELS**

YOU CAN ORDER BY LETTER, TELEPHONE OR TELEX

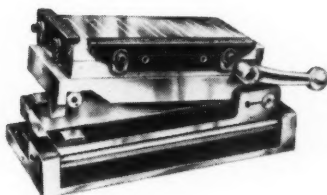
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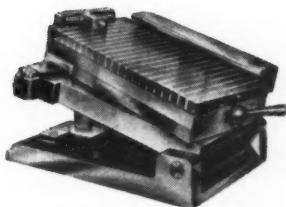
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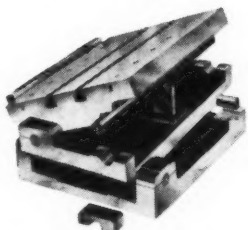
Compound Sine Table with 'T' Slotted Face: 12in. by 8in.



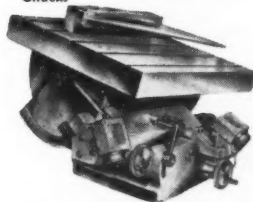
Compound Sine Table with Non-Electric Magnetic Face: 10in. by 5in.



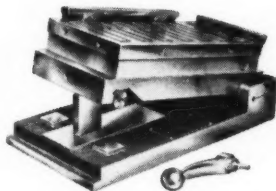
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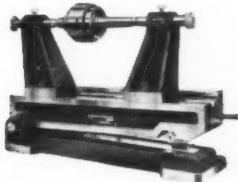
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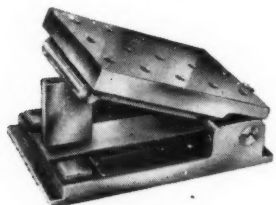
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Simple Angle Sine Table with Non-Electric Magnetic Face: 10in. by 5in.



Sine Centres, with or without extended base, surfaced parallel to the centre axis when at rest.

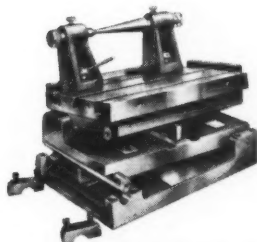


Simple Angle Sine Table with Tapped Holes for Clamping: 6in. by 4in.

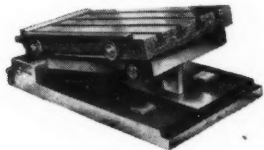


RANGE

Centres for most standard types can be supplied at extra cost.



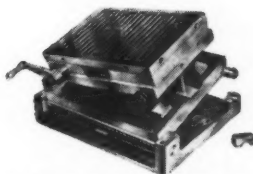
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Simple Angle Sine Table with 'T' Slotted Face: 12in. by 8in.

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Universal Compound Sine Table with Non-Electric Magnetic Chuck: 12in. by 8in.

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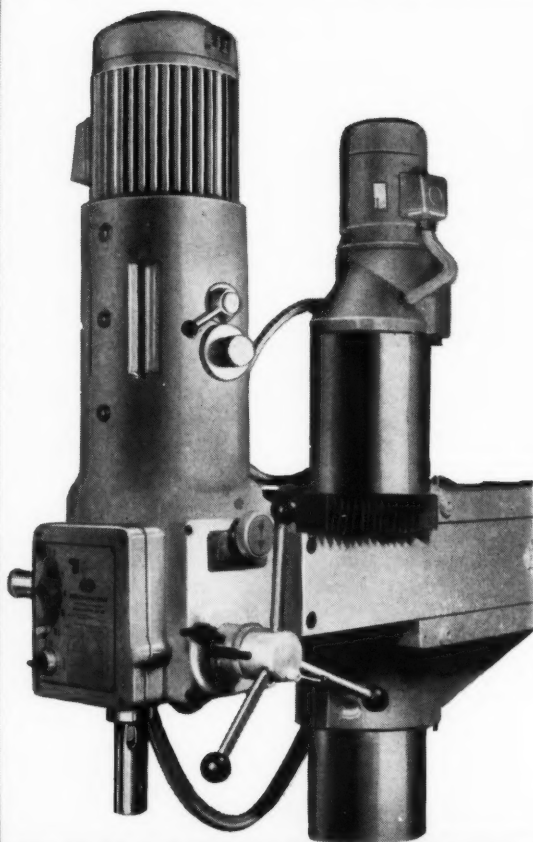
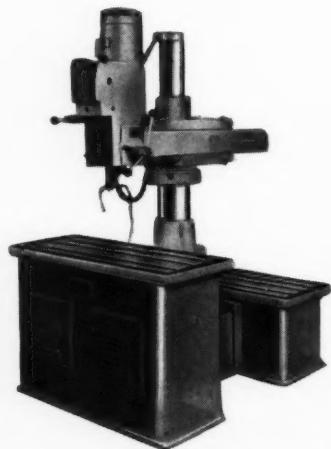
RADIAL DRILLING MACHINES

- ★ EASY OPERATION FOR UNSURPASSED PRODUCTIVE CAPACITY ON SHORT OR LONG RUNS.
- ★ FINGER-LIGHT MOVEMENT OF DRILLING HEAD.
- ★ CONTROLS CENTRALISED FOR MINIMUM OPERATOR FATIGUE.
- ★ GENEROUSLY PROPORTIONED WORK-TABLE FOR MULTIPLE FIXTURES OR LARGE COMPONENTS.

MODEL DB 25 AVAILABLE IN FOUR BASIC TYPES

- (A) Drilling head **without** electro-mechanical feed **without** tapping mechanism
- (B) Drilling head **with** electro-mechanical feed **without** tapping mechanism
- (C) Drilling head **without** electro-mechanical feed **with** tapping mechanism
- (D) Drilling head **with** electro-mechanical feed **with** tapping mechanism

CAPACITY Drilling up to 30mm.—1 $\frac{1}{2}$ in.
Tapping up to M18 $\frac{1}{2}$ in. M24 $\frac{1}{2}$ in.



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**WRIGHT ELECTRIC MOTORS
(HALIFAX) LTD.**

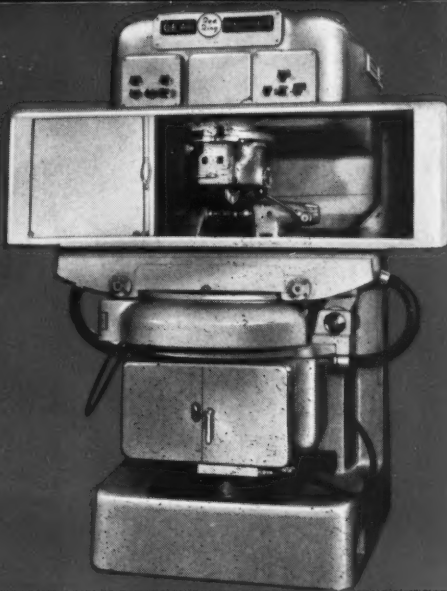
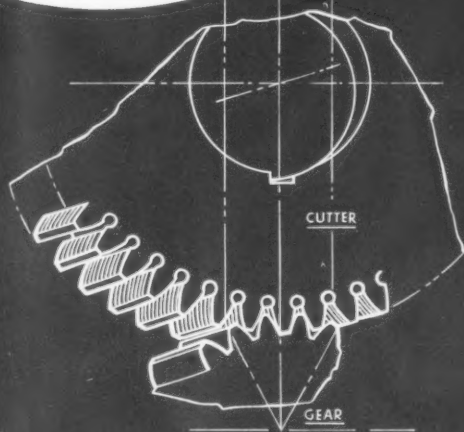
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Established 1900

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ROTARY GEAR SHAVING

OVER 30 YEARS
EXPERIENCE IN
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BASIC PRINCIPLES OF ROTARY SHAVING

The "RED RING" rotary shaving process is based on two fundamental principles. One is the use of a gashed rotary cutter in the form of a helical gear—a gear having a different helical angle from that of the work gear to be shaved. The second principle is the patented method of crossing the axes of cutter and work gear at a limited angle for the shaving operation.

When the cutter and work gear are rotating in close mesh, the edge of each gash shaves a fine, hair-like chip as it moves over the surface of the work gear tooth. The finer the cut, the less pressure required between tool and work and consequently there is a reduced tendency to cold-work the surface metal of the work gear tooth.

RED RING MODEL GCU UNIVERSAL DIAGONAL SHAVING MACHINE

A typical example of a widely used rotary gear shaving machine is the "RED RING" Model GCU, which incorporates all the significant improvements and refinements in gear shaving practice, developed over the past 30 years, thus making it the most versatile and effective unit of its kind.

In accordance with "RED RING" practice, the cutter head, which is a relatively small unit, is located above the work. Head and tail stocks, together with the tables, comprise a much heavier unit located below the work and are always under compression. After being set the cutter head is clamped while the tables have running clearance. This arrangement offers two additional advantages. In the event of work gear being accidentally dropped when loaded it cannot damage the cutter and, with the cutter located above the work, chips readily fall away from it.

Present Delivery 3 months



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING,
GEAR HONING AND ELLIPTOID

PRECISION GEAR MACHINES & TOOLS LIMITED

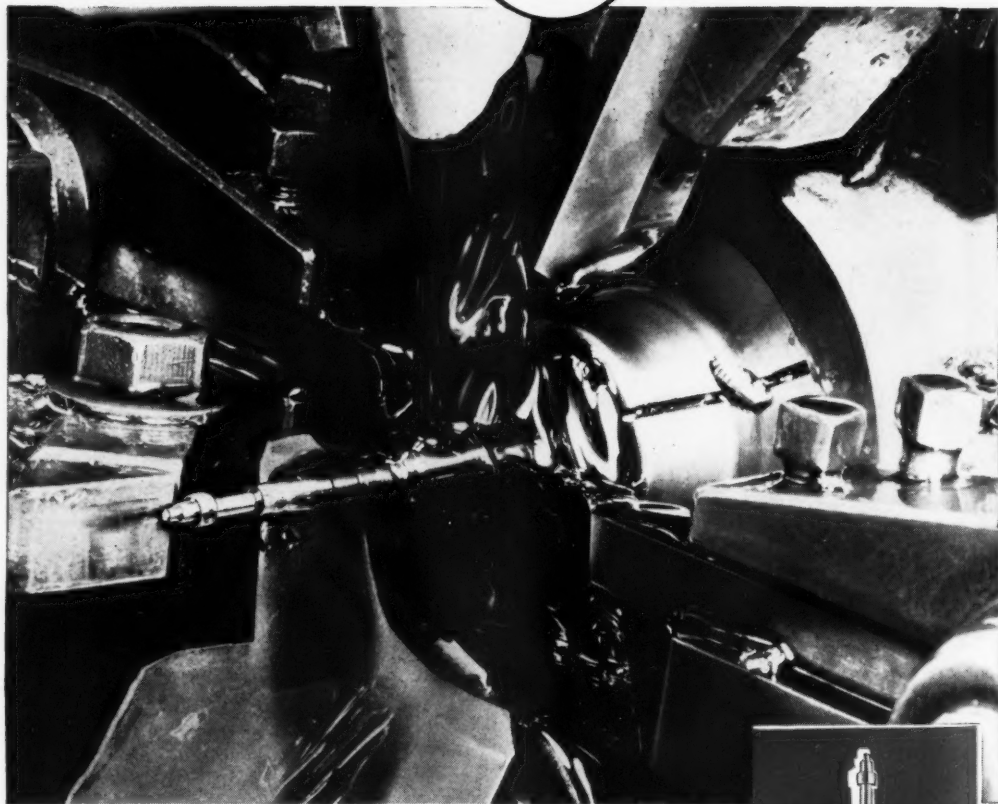
(An Associate Company of National Broach & Machine Co., Detroit, U.S.A.)
"World's Largest Producer of Gear Shaving Equipment"

RED RING WORKS, BODMIN ROAD, COVENTRY

Telephone: Walsgrave-on-Sowe 2372 Telegrams: Pregearmac, Coventry

When answering advertisements kindly mention MACHINERY.

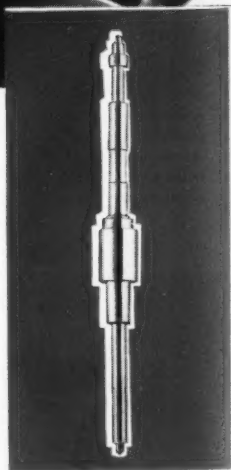
FERRANTI CHOOSE CUTTING OILS



SULTEX CUTTING OIL being used on a Peterman Automatic producing transmission shafts for electric meters. Operation involves 12 different shaft diameters. Tolerance 0.0015". Time cycle 3 minutes 40 seconds. Photograph taken in the works of Ferranti Ltd., Hollinwood, Lancs.

FERRANTI CHOOSE WISELY —for production managers and engineers throughout the world know that Regent and Caltex cutting oils permit working to the finest tolerance, speed output and keep production costs down. And Regent doesn't stop there. Research teams work constantly to produce new oils to meet the swiftly growing needs of modern industry. Regent have a complete range of cutting oils to suit every existing metal working job and to give you faster operation, improved finish, longer tool life and increased working efficiency. There's a Regent engineer ready to advise you on exactly which oil to use.

REGENT OIL COMPANY LTD., 117 PARK STREET, LONDON, W.1



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Meehanite

means
**CASTING
QUALITY**



TAKE ADVANTAGE OF THIS FREE OFFER

For more facts about Meehanite castings, write for any of the bulletins listed below, which will gladly be sent upon request.

- L7 Casting Design—10 basic rules
- L8 Meehanite Casting Properties
- L9 Cut Costs with good Design

When you specify Meehanite—you are getting a high quality casting. Meehanite castings are controlled to give uniform soundness, accuracy and good finish and machinability. You can depend upon Meehanite castings to give you a better performance in service . . . so put this dependability to work for you.



MEEHANITE

THE INTERNATIONAL MEEHANITE METAL CO., LTD., EPSOM, SURREY

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whatever shape you



you have in mind

specify

SPEEDICUT
TOOLS

to

shape it

faster

F I R T H B R O W N T O O L S L I M I T E D

S P E E D I C U T W O R K S C A R L I S L E S T . E A S T S H E F F I E L D



4-Way Production Savings with Ex-Cell-O Way Machines

- | | |
|--------------------------------|---------------------------|
| 1 LOWER COST | 3 MORE VERSATILITY |
| 2 INCREASED FLEXIBILITY | 4 GREATER CAPACITY |
- ASK YOUR EX-CELL-O REPRESENTATIVE FOR DETAILS**

EX-CELL-O FOR PRECISION

AGENT: Ex-Cell-O Group Sales Ltd
Halford House, Charles Street, Leicester
Telephone: Leicester 26791
Telegrams: GROUPEX, Leicester

EX-CELL-O CORPORATION
(MACHINE TOOLS) LTD. HASTINGS ROAD, LEICESTER

June

Fe



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**Up-to-date
planing
with
machines
of
precision
and
sturdiness**

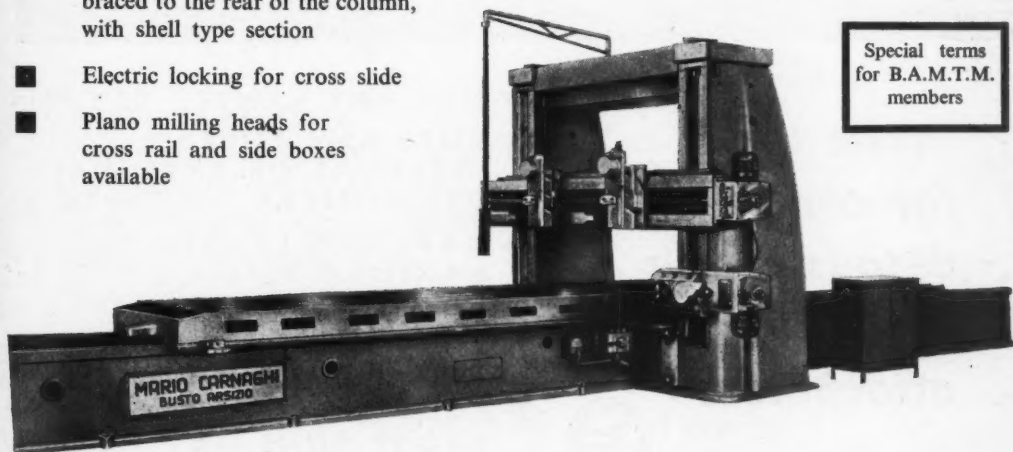
CARNAGHI

Features include:—

- Robust construction throughout
- Massive and rigid bed
- Generously dimensioned table
- Cross rail strongly ribbed and braced to the rear of the column, with shell type section
- Electric locking for cross slide
- Plano milling heads for cross rail and side boxes available

Can be supplied with
Electro magnetic clutch
drive, Ward Leonard or
hydraulic

Special terms
for B.A.M.T.M.
members



Send for full details of the Carnaghi Range to:—

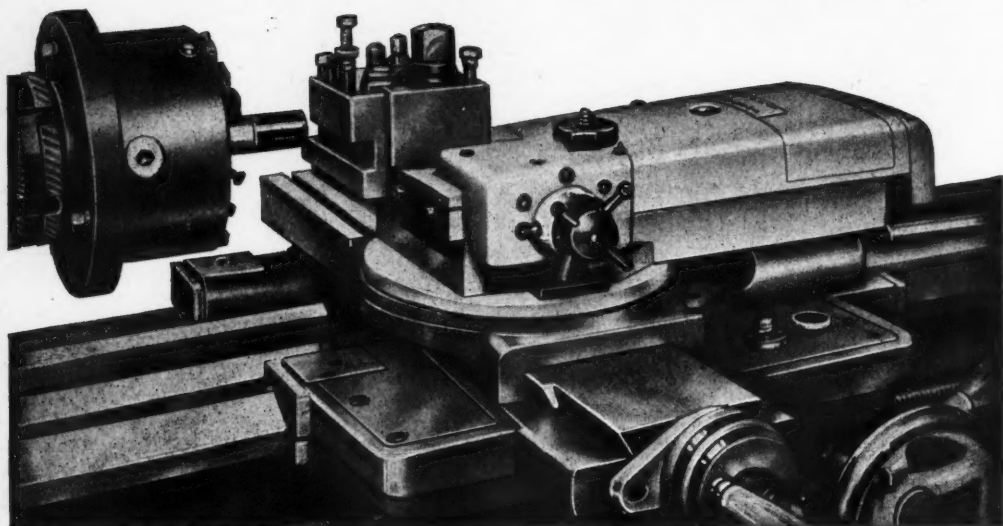
HERBERT WIDDOWSON & SONS LIMITED

Canal Street Works, Nottingham. Tel. 51891 (4 lines) Grams. TOOLS NOTTINGHAM

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FILEMATIC

high speed THREAD CUTTING ATTACHMENT



**Write today
for complete
details of this
revolutionary
attachment**



- ▶ FITS ANY CENTRE LATHE
- ▶ CUTS ANY THREAD...
INTERNAL OR EXTERNAL
CYLINDRICAL OR TAPER
- ▶ MAXIMUM LENGTH 17in.
MAXIMUM PITCH 5. T.P.I.
- ▶ THREAD RIGHT UP
TO A SHOULDER...
INSTANT WITHDRAWAL
- ▶ EQUALLY SUITABLE FOR
SHORT RUNS OR
LARGE SCALE PRODUCTION

HERBERT WIDDOWSON & SONS, LTD
CANAL STREET WORKS · NOTTINGHAM · ENGLAND

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The new **SICMATIC** AUTOMATIC & SEMI-AUTOMATIC HYDRAULIC PROFILING LATHES

Duplomatic Hydraulic System.
Hardened Bed Slideways.
Auto cycling up to six depths of cut.
Hydraulic tailstock for drilling and boring.
Uses template or existing component.
Eight models to choose from.

Basic price under £2,000.

SPECIFICATION

Bore of spindle	..	2½ in.
Spindle nose	..	5 in. A.S.A.
Max. swing over bed	..	15½ in.
Max. swing over saddle	..	9½ in.
Max. length turned	..	27½ in.
Hydraulic traverse of copying slide	..	4 in.
Hydraulic feed of tailstock spindle	..	4½ in.
Number of feed rates to copying slide	..	48
Max. tool pressure	..	1,300 lbs.

EARLY DELIVERY

DAILY DEMONSTRATIONS AT OUR WORKS:

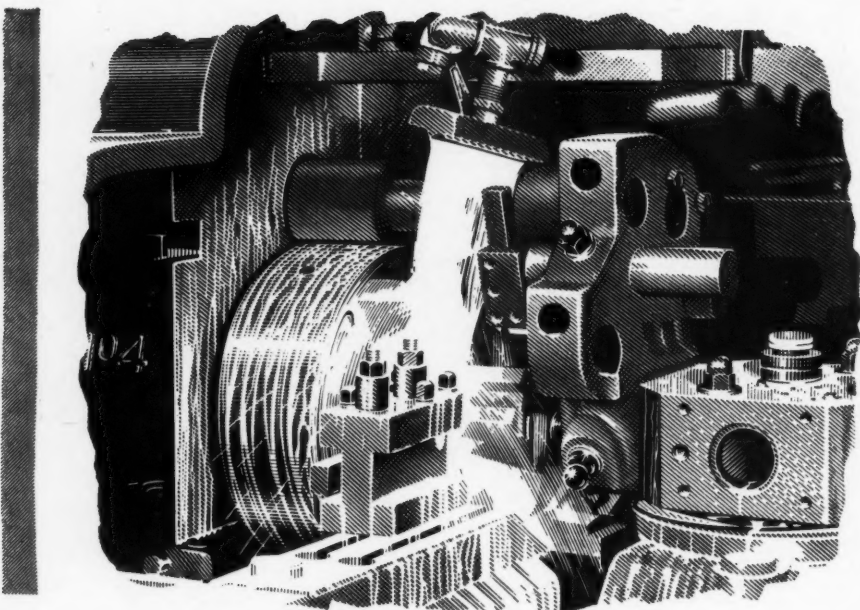
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CANAL STREET WORKS NOTTINGHAM

TELEPHONE: 51891 (3 lines)

TELEGRAMS: TOOLS NOTTINGHAM

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F2



Who fixed the production target?

Not every machine operator has stars in his eyes! For the rest, a mundane sequence of speed changes, feeds and cuts produces a lot of little parts that other people want. And the easier the ways of doing this, the happier are both a bonus-seeking worker and a budget-minded management. In this idyllic atmosphere, it seems downright unsporting to drop a spanner in the works—and a whacking big one at that! Frankly, we don't always agree that the way things are done in metal cutting is necessarily right. Producing such good cutting

fluids—and so many of them—tends to bias our outlook of course but have you ever tried, at one and the same time, to pull the wool over the eyes of a metallurgist, a planning engineer, a graph-watching production assistant and—bless them—a cost-conscious purchasing officer? It is just impossible. The fact is Fletcher Miller cutting fluids are on good terms with all these gentlemen—and those worthy fellows at shop floor level who actually use them. Relieve yourself of one headache by consulting us about all your production oils. The cure is quite painless. Call in the experts.

choose

FLETCHER MILLER

cutting fluids

FLETCHER MILLER LTD., HYDE, CHESHIRE
Telephone: HYDE 3471 (5 lines) Telegrams: EMULSION, HYDE

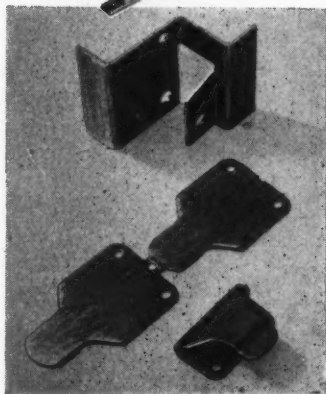
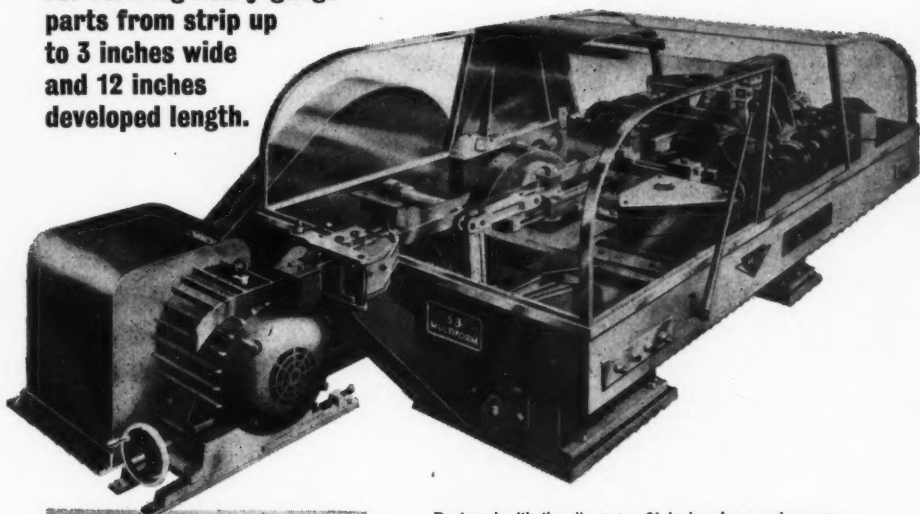
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HEENAN

Multiform



For forming heavy gauge parts from strip up to 3 inches wide and 12 inches developed length.



Designed with the die space 31 inches long and accommodating three individually operated diesets, if required, each 10 inches long, the Heenan S.3 Multiform is particularly suitable for the automatic forming of parts requiring substantial presswork, such as piercing, stamping, coining, blanking, embossing and trimming, using progression tooling. Press rams can be operated from front or rear, with 30 tons loading to each ram.

Output rates are variable from 40 to 120 parts per minute. The machine is particularly robust and has been designed to cater for the particularly heavy loads exerted when working on heavy gauge strip.

If fast multi-forming is new to your Company you may freely borrow a 16 m.m. colour film "The Heenan Multiform" which fully describes the technique. Write sole agents below.



WICKMAN



LIMITED

FACTORED MACHINE TOOL DIVISION, BANNER LANE, COVENTRY. Tel. Tile Hill 65231

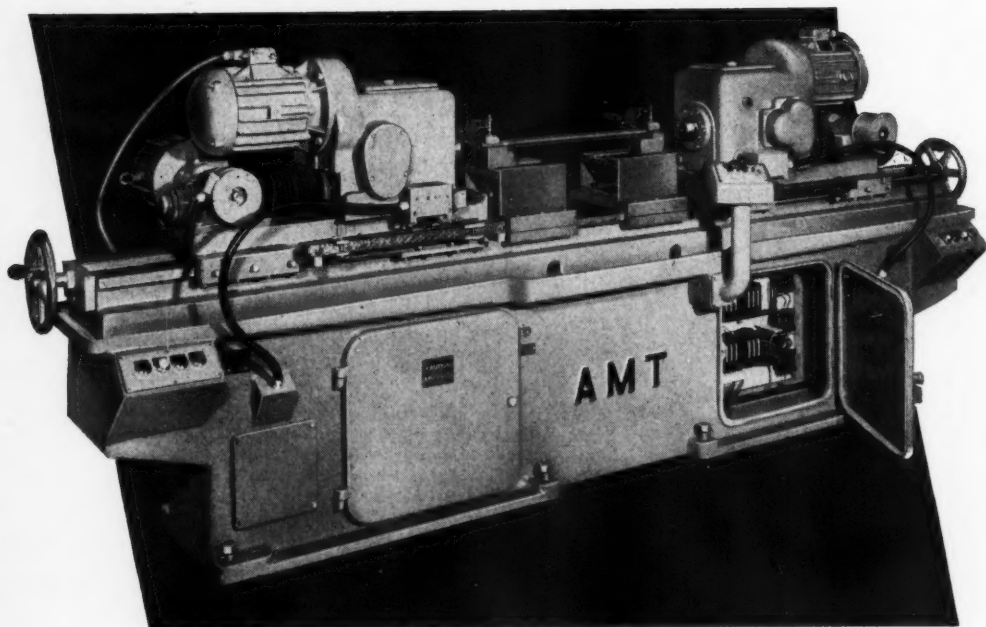
600 FEB

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ANOTHER EXAMPLE OF

AMT UNIT HEADS

**INCORPORATED INTO A VERSATILE
2-WAY DRILLING MACHINE —**



Photograph by courtesy of Accles and Pollock Ltd.

Double Ended Machine incorporating two A.M.T. DI Units of 2 H.P. Capacity, each unit separately adjustable on the base to accommodate lengths of components up to 48 inches in length. Each unit can be individually or collectively operated on the following cycles:

**DRILLING, COUNTERBORING, JUMP GAP
DRILLING AND TAPPING**

BROCHURE ON REQUEST **A.M.T. (B'HAM) LTD.**, Bournbrook, Birmingham 29
Telephone : SELly Oak 1128/9/20. Telegrams : AMTOLD, BIRMINGHAM

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SURFACE GRINDING MACHINES

for continuous and accurate production

These vertical surface grinders are robustly constructed for the high-output production of flat surfaces on almost all types of material. They can be relied upon for maximum production with minimum down time for servicing and maintenance—requirements of particular importance in the motor industry.

Available in a range of sizes with segmental grinding wheels up to 24 in. diameter and power of main drive motor up to 60 h.p.



This Type V10 Snow Vertical Surface Grinding Machine installed at Fisher and Ludlow Ltd., Birmingham, is grinding the centre faces of rear axle casings.

World Wide Distributors

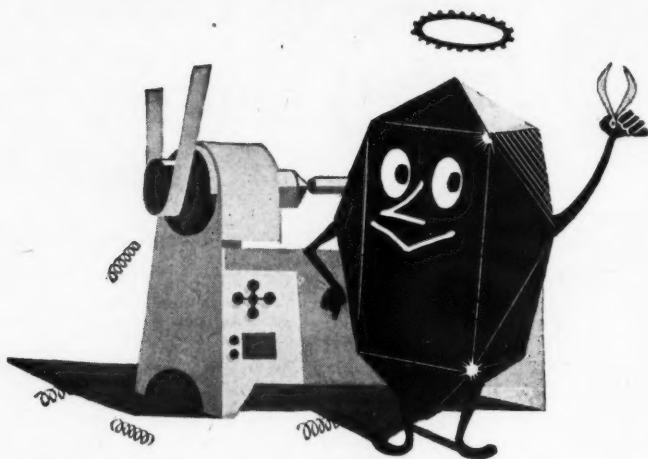
DRUMMOND-ASQUITH LIMITED

Member of the Asquith Machine Tool Corporation

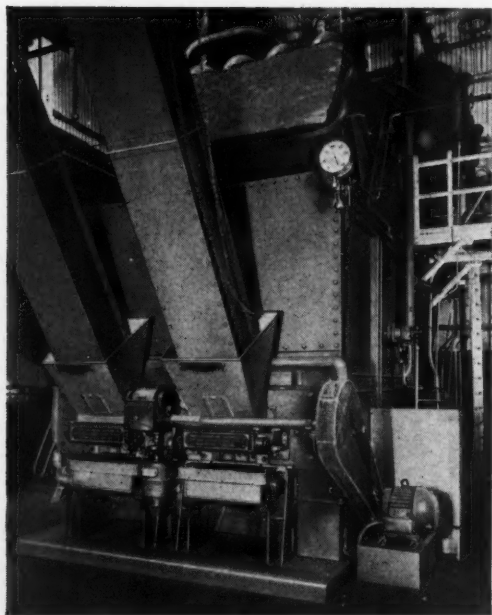
KING EDWARD HOUSE, NEW ST., BIRMINGHAM Phone: Midland 3431. Also at LONDON Phone: Trafalgar 7224 & GLASGOW Phone: Central 0922

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SN 469



COAL-properly used- is the cheapest fuel for the Light Engineering Industry



Coking stokers feed coal continuously, quietly and invisibly into this boiler.

Much of the prosperity of Britain rests upon the growing strength of the Light Engineering Industry—an industry that embraces both small workshops and the vast and complex factories employing thousands of people. Obviously, every light engineering works has to keep its products priced as keenly as possible in the face of the rising costs of labour and raw materials and economic pressures from both domestic and foreign competition. This calls for shrewd management and the sound assessment of every possible economy on a long-term basis.

BEGIN AT THE BEGINNING—THE BOILERHOUSE

There are still some industrial concerns that handicap their finances with outdated boilerhouses. To modernise other machinery while 'making-do' with inefficient boilers is to throw good money down the drain. Modern coal-burning installations can be so efficient that they will more than pay for themselves in a remarkably short time. They are, without question, the first essential in a factory that is going to make rising profits for its management.

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COAL IS THE RELIABLE FUEL

One question for any long-term planning is obvious: can supplies of coal be guaranteed? The answer is yes—without qualification. The mining industry, Britain's largest single industry, is becoming increasingly efficient; its equipment is the best of its kind. And British coalfields contain enough coal to supply every industrial demand for centuries to come.

COAL IS CLEANER, HOTTER

Modern grading and washing methods ensure that coal is the most efficient and consistent fuel for every type of boiler—the ideal fuel for every section of the light engineering industry. But to obtain the maximum heat at the lowest cost, coal should be mechanically stoked. A mechanical stoker automatically feeds the right amount of coal for the boiler load even when the load is varying; it burns coal at optimum efficiency all the time without the emission of smoke (thus complying with the regulations in Smoke Control Areas) and it virtually replaces the human element in boiler operation.

There are many types of mechanical stokers, of which the most commonly used are the Chain Grate stoker, the Coking stoker, the Underfeed stoker and the Sprinkler stoker. Standard models are available for all sizes of boiler.



Two underfeed stokers feeding coal direct from a storage hopper into a modern vertical boiler.



DELIVERY—ON THE DOT—ON THE SPOT

The delivery of industrial coal is today highly organised and completely reliable. Leading coal merchants have completely overhauled delivery and storage systems and are fully equipped to make sure that you get the right grade of coal when you want it and where you want it.

Furthermore, completely mechanised handling systems will transport coal from storage to furnace without any manual labour at all.

FINANCE PLAN FOR INDUSTRY

No deposit, repayments spread over five years, low interest charges that can be set against tax, full investment and other capital allowances that can be claimed at once; these are the terms available to the manufacturer or businessman who wants to install modern coal-burning equipment without touching his capital resources.

Make use of the National Coal Board Industrial Finance Plan. The loans are made by Forward Trust Limited, who are members of the Midland Bank Group. A 'phone call or a letter to the Regional Office of the National Coal Board will bring you full details.



AND—WHEN YOU NEED IT— A NATION-WIDE FREE SERVICE

At a flick of your finger, you can call upon one of the most comprehensive and efficient technical services in the world. Call either your coal supplier or the Regional Office of the NCB for an authoritative answer to your problem.

**SOLID FUEL—more heat at
less cost—and it's British**

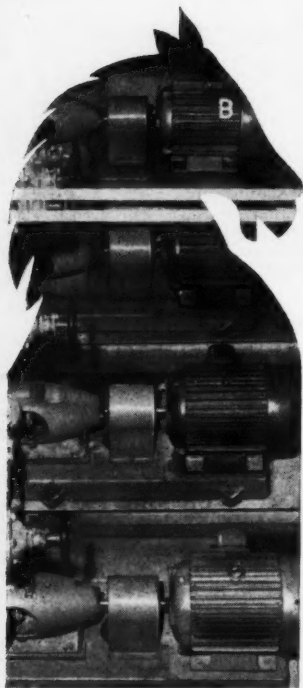
**PROGRESSIVE INDUSTRY IS
GOING FORWARD ON**

COAL

ISSUED BY THE NATIONAL COAL BOARD

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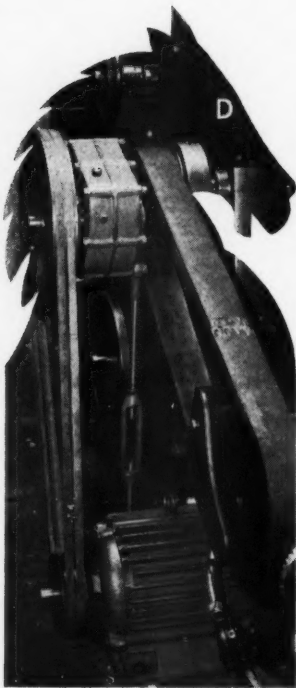
WILLING HORSES.. from BROOK



3½ h.p. motors driving solvent pumps on a dry cleaning plant.



Roadstone mixing equipment with a 30 h.p. motor on the dryer fan.



Carding machine drive with torque arm reducer, powered by a 5 h.p. motor.



TOTALLY ENCLOSED FAN COOLED

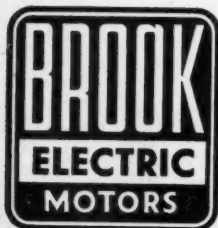
'D' Type Standardized motor with class 'B' insulation. Lighter weight — Smaller size — Cost saving — Fully interchangeable for fixing dimensions.



LARGE SLIP RING

Cage or slip ring types in larger Drip Proof frames up to 600 h.p. T.E. Fan Cooled motors are offered up to 275 h.p.

The easiest way to clear up an electric motor problem is to take advantage of BROOK knowledge and experience. Easy, because all you have to do is to pick up the 'phone and dial one of the numbers below. Technical advice and speedy attention are yours for the asking.



Huddersfield 6400 — London MET. 9401/7 — Aberdeen 21890
Birmingham Mid. 0182/5 — Bristol 27671/2 — Glasgow Cen. 1045
Leeds 34303/4 — Leicester 50781/3 — Liverpool Roy. 4100 & 6261
Manchester Cen. 8305/7 — Newcastle 81-4338/9 — Norwich 25099-
23444 — Nottingham 55412/3 — Plymouth 62609 — Sheffield 28477/8
Swansea 57559

Huddersfield

61/BDC

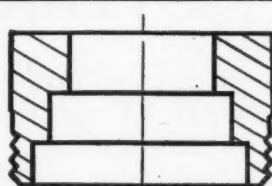
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Yet another example of **PRODUCTIVITY!**

KUMMER

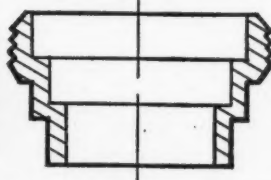
There are many operations where the Kummer K20 can show handsome savings. This is one of many typical examples. Suitable for work on bar, castings, forgings and stampings.

K20 Semi-Automatic Twin-Head PRECISION LATHE...



Operation 1
Loading 6 secs
Machining 28 secs
Material—BRASS
(Billet)

SCALE FULL SIZE



Operation 2
Loading 6 secs
Machining 43 secs
Material—BRASS
pre-machined blank
from Op. 1.

- Work head spindle can automatically operate at high or low speeds according to preselected cutting speeds.
- Camshaft driven from main spindle.
- Cam accelerator reduces machining cycle time.
- Air-operated chucking
- Spindle positioning device for irregular shaped components.
- Easy loading of components into chucks.
- Write for full data.

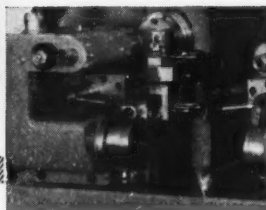


Illustration shows tailstock which is one of the many optional features available.

GASTON E. MARBAIX LTD.

**VISIT
STAND
No. 2207
HALL 2
BRUSSELS
EXHIBITION**

Devonshire House, Vicarage Crescent, Battersea, S.W.11.

Phone : Battersea 8888 (8 lines)

NRP 3424

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The **PLANER** You've Been Waiting for...

**REICHLE &
KNOEDLER**



The result of over 30 years experience. Available with 4-speed Gearbox or Ward Leonard Drive. Laminated plastic on table guide-way improves running. Table drive through helical gears. Single and Double Column models. Grinding and Milling Heads can be fitted.

**for rapid
metal removal**

rugged-accurate

Send for illustrated data, right away.

MORTIMER

EXCLUSIVE DISTRIBUTORS OF THE FINEST MACHINE TOOLS

MORTIMER MACHINE TOOL CO. LTD. : MORTIMER HOUSE : ACTON LANE : LONDON : NW10 Tel: ELGAR 3834-5-6

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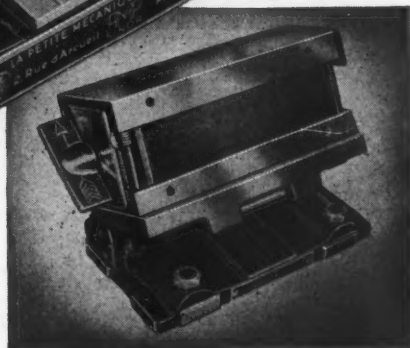
'HABIT' REGD. MINIATURE SINE TABLE

ACTUAL SIZE



**CLOSED
DIMENSIONS**
5" x 2½" x 1½"

This latest addition to the Habit range of Sine tables provides a means of accurately locating angular work of small dimensions for inspection or grinding, jig boring, drilling and other machining operations.



The table is dimensioned to accept the Eclipse Double Sided Junior Magnetic Chuck.

HABIT DIAMOND TOOLING LIMITED

LURGAN AVENUE, LONDON, W.6

TELEPHONE: FULHAM 7944

Telegrams HABIT, LONDON, W.6

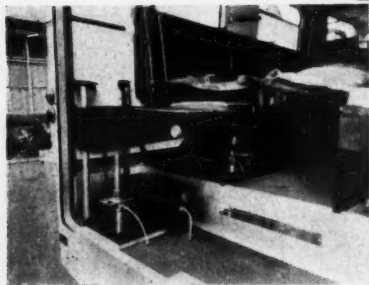
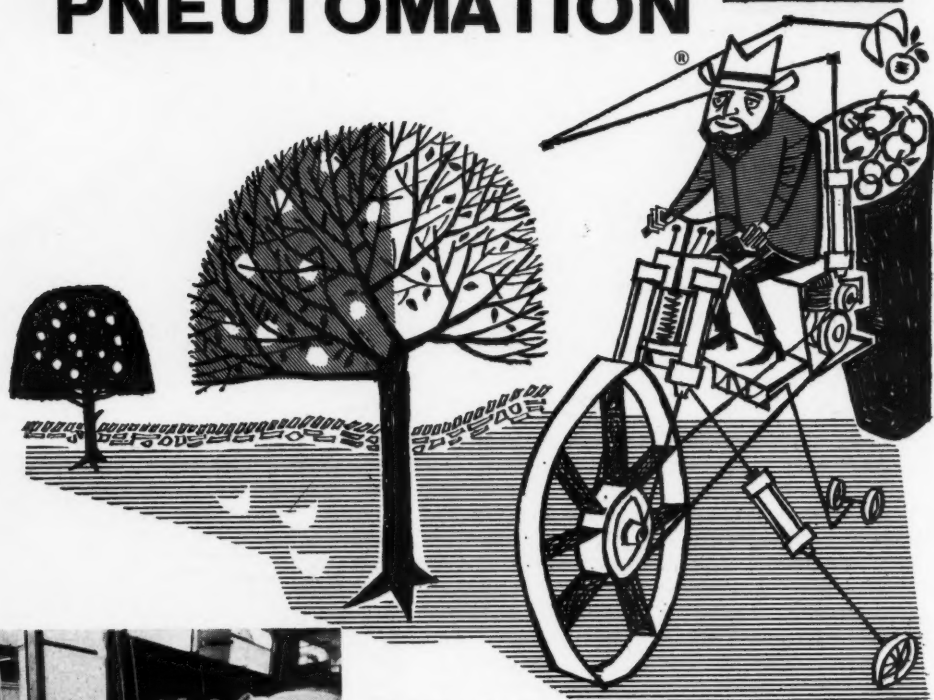
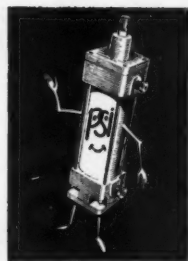
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there's a power in the land

says Mr. SQUINCH

*. . . . that does a power
of good; it's*

PNEUTOMATION



Pneumatation installed in an ambulance

Write to

Lang Pneumatic Ltd

(ASSOCIATED WITH DESOUTTER BROTHERS [HOLDINGS] LTD.)
VICTORY WORKS · OWEN ROAD · WOLVERHAMPTON Telephone: 25221-2-3 Telex: 33193

Man, since he invented machines, has been overwhelmed with power.

The Man at Lang Pneumatic went one better, he invented PNEUTOMATION®.

PNEUTOMATION® has power over machines; the power to increase production by controlling operations and eliminating human errors and worker fatigue.

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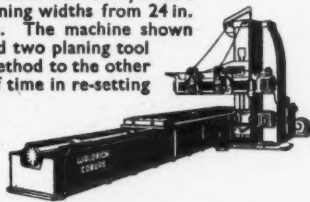


WALDRICH

Oil Hydraulic Planing Machines

Openside and Double Column Planing Machines with oil-hydraulic table operation and feed mechanism. Planing widths from 24 in. up to 128 in. for all usual planing lengths. The machine shown above is arranged with one milling head and two planing tool boxes. Change over from one machining method to the other can be quickly accomplished without loss of time in re-setting the component.

Write today for full details of the range of Planing Machines and Plano-Milling Machines manufactured by **WALDRICH COBURG, K.G.**



Sales and Service for the British Isles

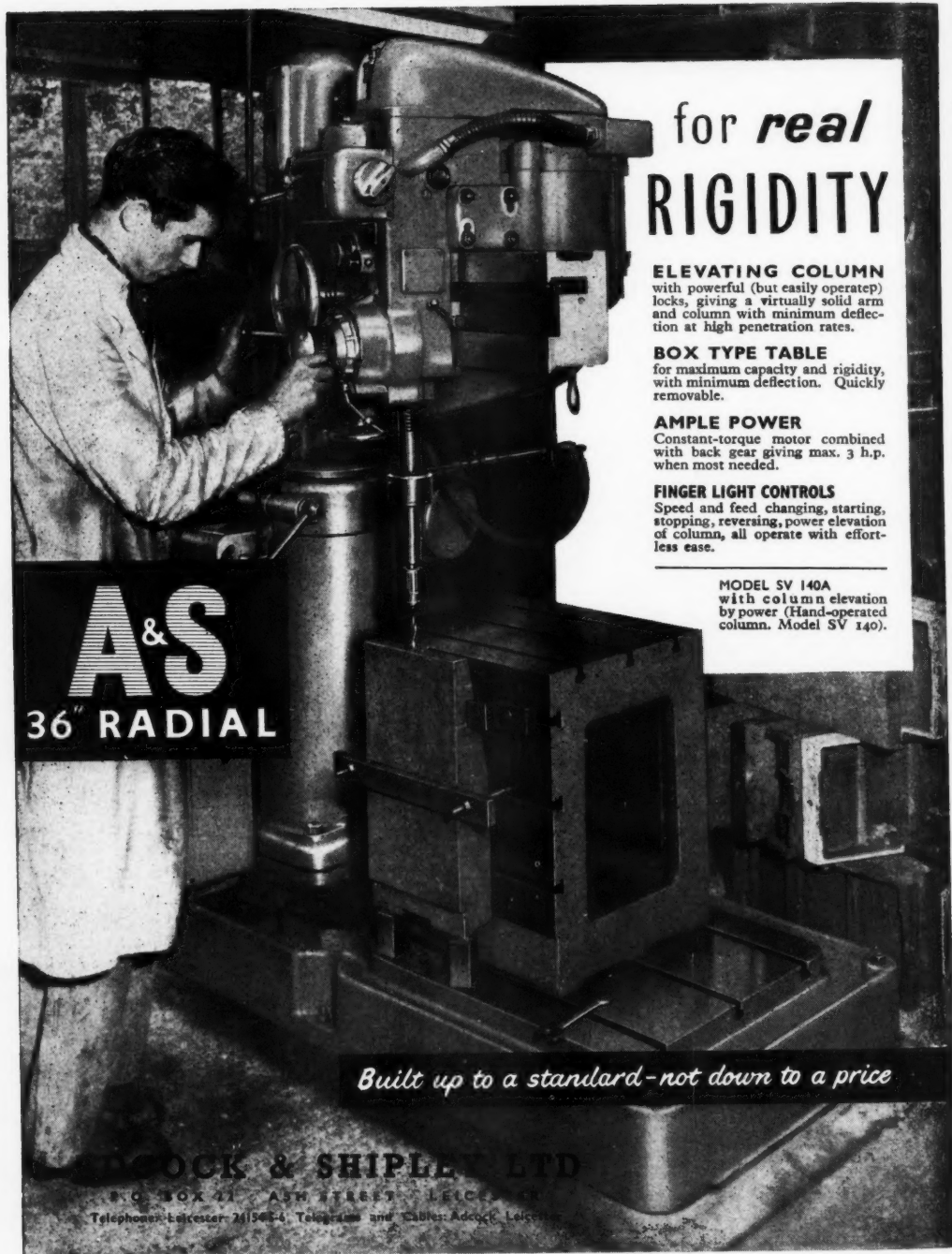
DRUMMOND-ASQUITH LIMITED

Member of the Asquith Machine Tool Corporation

KING EDWARD HOUSE, NEW ST., BIRMINGHAM Phone: Midland 3431. Also at LONDON Phone: Trafalgar 7224 & GLASGOW Phone: Central 0922

IFH33

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for *real*
RIGIDITY

ELEVATING COLUMN
with powerful (but easily operated) locks, giving a virtually solid arm and column with minimum deflection at high penetration rates.

BOX TYPE TABLE
for maximum capacity and rigidity, with minimum deflection. Quickly removable.

AMPLE POWER
Constant-torque motor combined with back gear giving max. 3 h.p. when most needed.

FINGER LIGHT CONTROLS
Speed and feed changing, starting, stopping, reversing, power elevation of column, all operate with effortless ease.

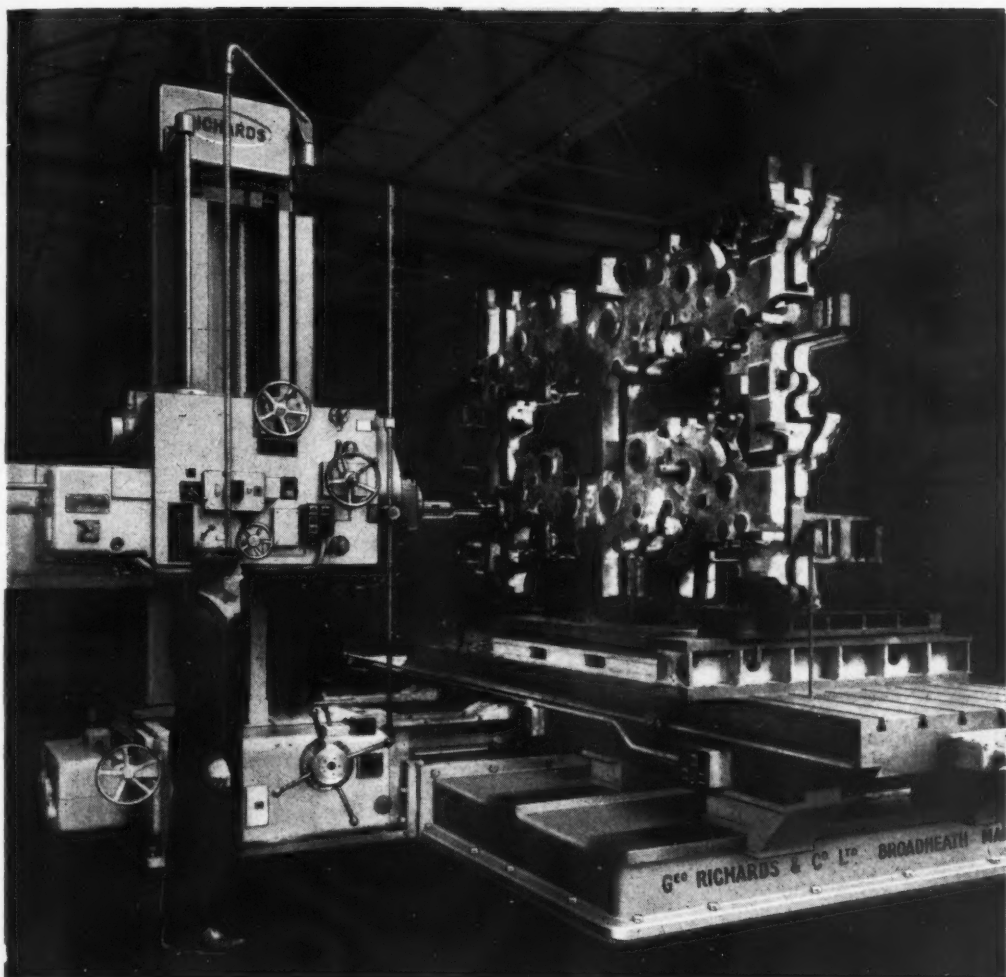
MODEL SV 140A
with column elevation by power (Hand-operated column. Model SV 140).

A&S
36" RADIAL

Built up to a standard—not down to a price

ADCOCK & SHIPLEY LTD
P.O. BOX 41, ASH STREET, LEICESTER
Telephones: Leicester 24154-4, Telegrams and Cables: Adcock, Leicester

When answering advertisements kindly mention **MACHINERY**.



STAVELEY **SG** GROUP

Further details of any of the wide range of Richards Machines are given in pamphlets, copies of which will be gladly sent on request.

Illustrated above is a Richards Wide Bed Type Horizontal Boring, Facing and Milling Machine, with Traversing Spindle, in plant at the Preston works of the Goss Printing Press Co. Ltd. The machine is shown boring and facing the side frames of a printing machine, and has an 18ft. 0in. wide bed, a 15ft. 0in. by 6ft. 0in. sliding table, fitted with optical scale projectors.

The machine is representative of a full range of Horizontal Boring, Facing and Milling Machines, which include Table, Wide Bed, Saddle Support, Floor and Planer types, supplied with and without traversing spindle. The range can be further increased with combinations of extended height, bed length and width, and table size if required.

RICHARDS

GEORGE RICHARDS & CO. LTD. BROADHEATH ALTRINCHAM CHESHIRE

Telephone: ALTRINCHAM 4242 (9 lines) Telegrams: RICHARDS, ALTRINCHAM

Sole Agents: ALFRED HERBERT LTD. FACTORED DIVISION COVENTRY

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G



POLLARD MEANS BEARINGS



POLLARD BALL & ROLLER BEARING CO. LTD

FERRYBRIDGE • KNOTTINGLEY • YORKSHIRE • Tel: 2323 • Telex: 55166

distribution throughout the world

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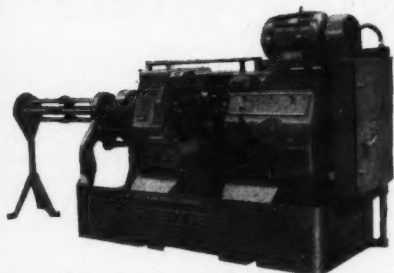
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tools
comp
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Moto

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set-u
hopp
hour

B.S.
ma
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B·S·A

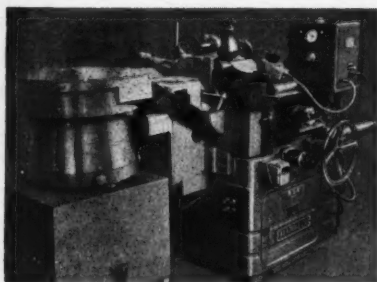
production machines



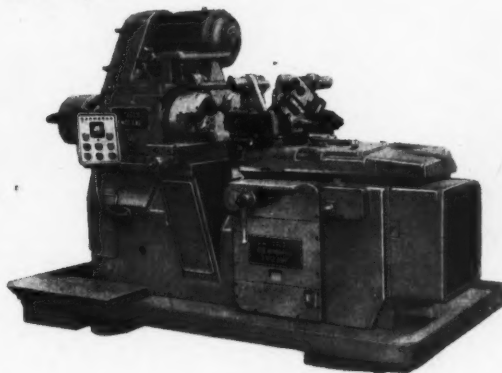
B.S.A. ACME-GRIDLEY 6" six-spindle automatic bar machine. Designed for high spindle speeds and fast cycle times combined with accuracy and good surface finish. Machine has two position feeding and stock can be fed during index. The main toolslide is provided with end adjustment to assist setting up for components of similar design but of varying length. Collet capacity $\frac{1}{8}$ " dia. Length fed and turned 4". Speeds 4,340 to 321 r.p.m. Motor 15 h.p.



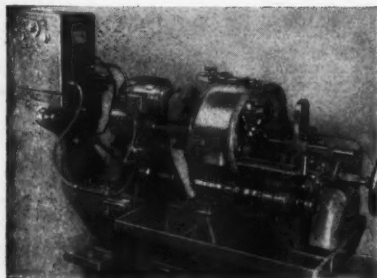
B.S.A. 5M single-spindle chucking automatic linked to a B.S.A. ACME-GRIDLEY 6" six-spindle chucking automatic. After first operation machining the component is conveyed via the overhead chute to the multi-spindle machine for completion. Chucking is electro pneumatic.



B.S.A. No. 4 centreless grinding machine with automatic sizing control and automatic infeed. In this set-up special bolts $\frac{1}{8}$ " x $2\frac{1}{2}$ ", fed from vibratory type hopper, are ground to a tolerance of 0.0005"; 700 per hour.



B.S.A. No. 95 All-Electric single-spindle automatic chucking machine with "DISCOTROL" programme control unit. (Complete machining programme for a component recorded on a master disc). Immediate changeover effected by substituting a new programme disc and appropriate tooling. Re-setting of machine speeds and feeds eliminated. Highly sensitive overload device protects tooling. Five-face turret. Swing over cross slides $10\frac{1}{2}$ " (maximum swing $12\frac{1}{2}$ "). Stroke: of cross slides 4", of turret $5\frac{1}{4}$ ". Thirty spindle speeds: 40 to 834 or 60 to 1220 r.p.m.



B.S.A. No. 48 single-spindle automatic screw machine arranged for automatic inspection of 0.0150" hole through component. Obstruction to an air blast through the hole causes a back pressure to be fed to a control which stops the machine.



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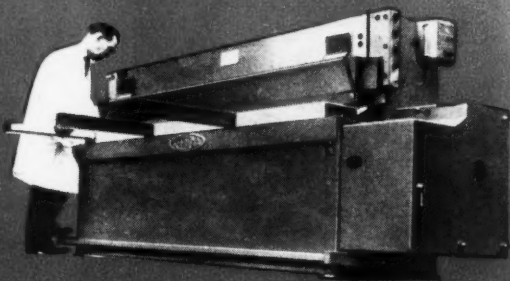
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G2

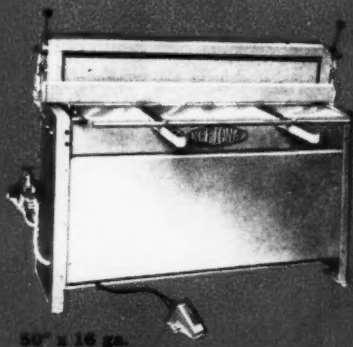


Shears and Bending Rolls

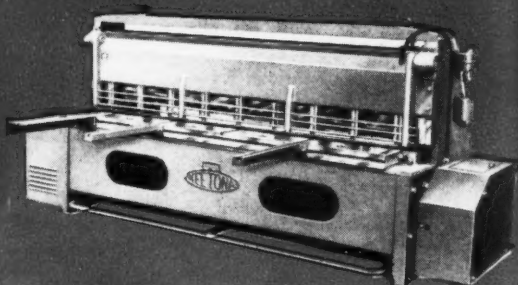
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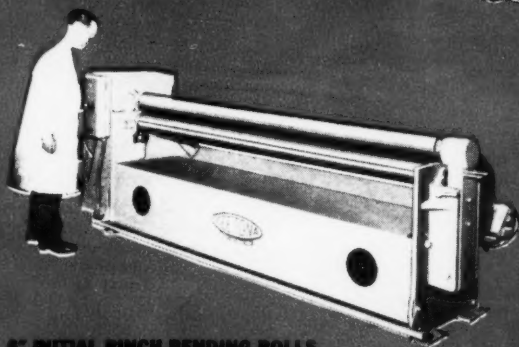


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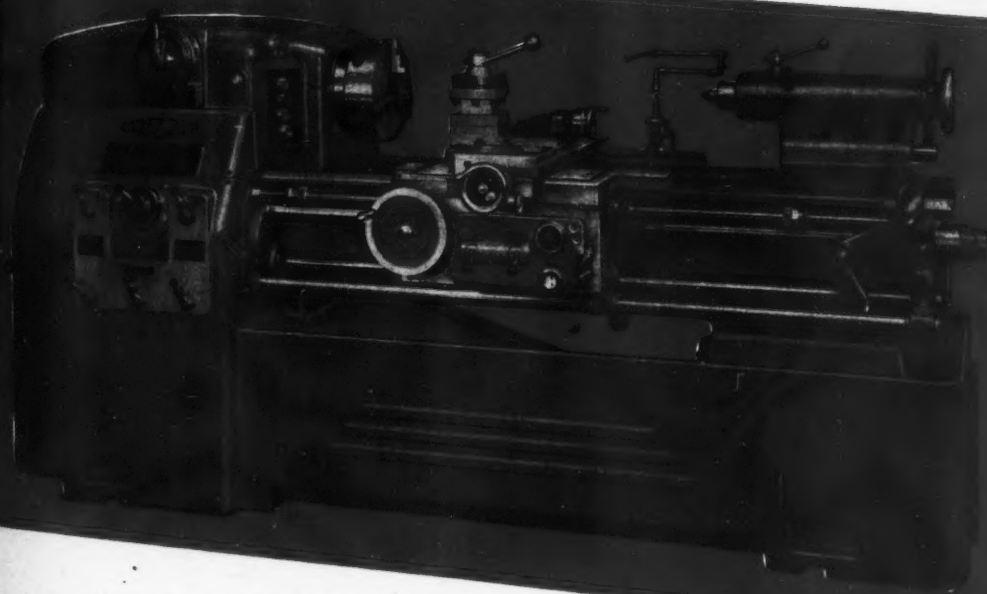
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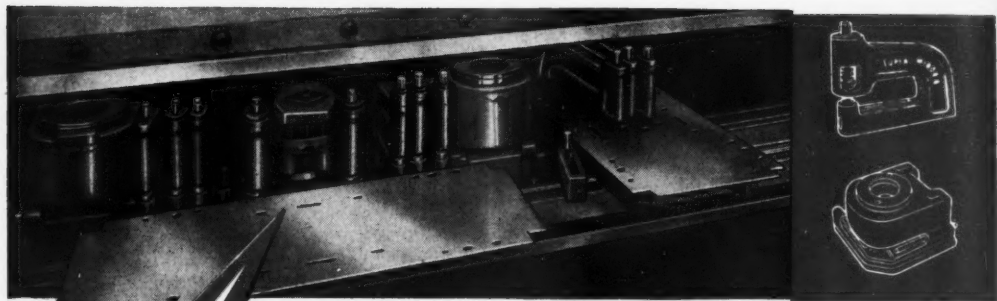
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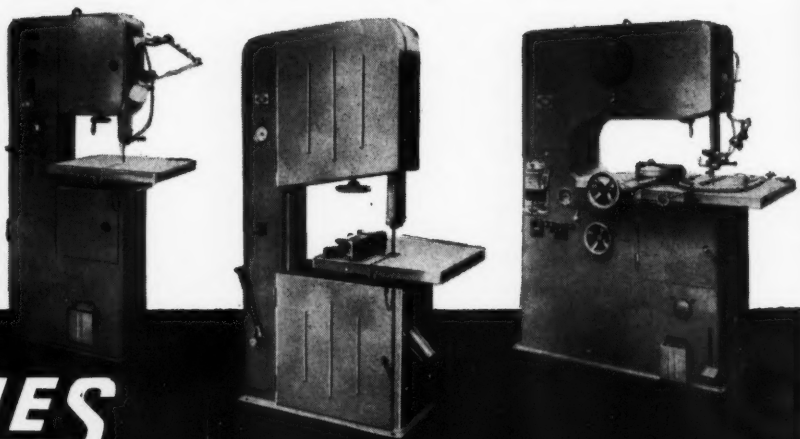
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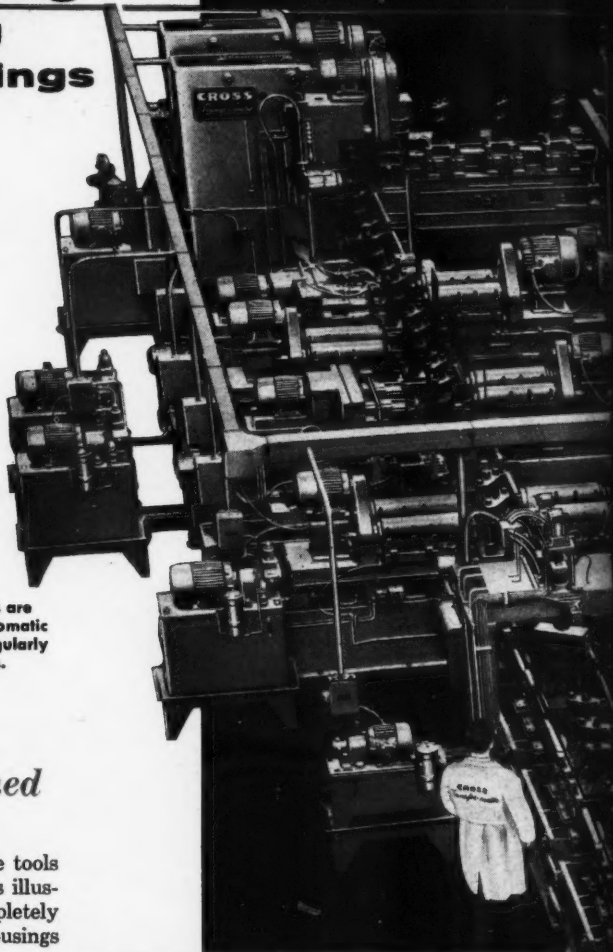
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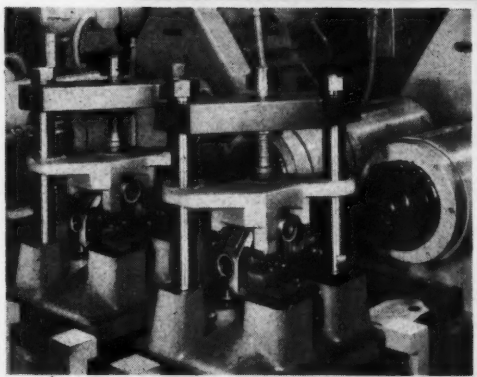
Useful life has been materially increased by building the Transfer-matic to process housings with longer pitman shaft extensions than those now being produced. Three idle stations permit other operations to be added and the use of standard Cross "building blocks" provides further flexibility for part design changes.

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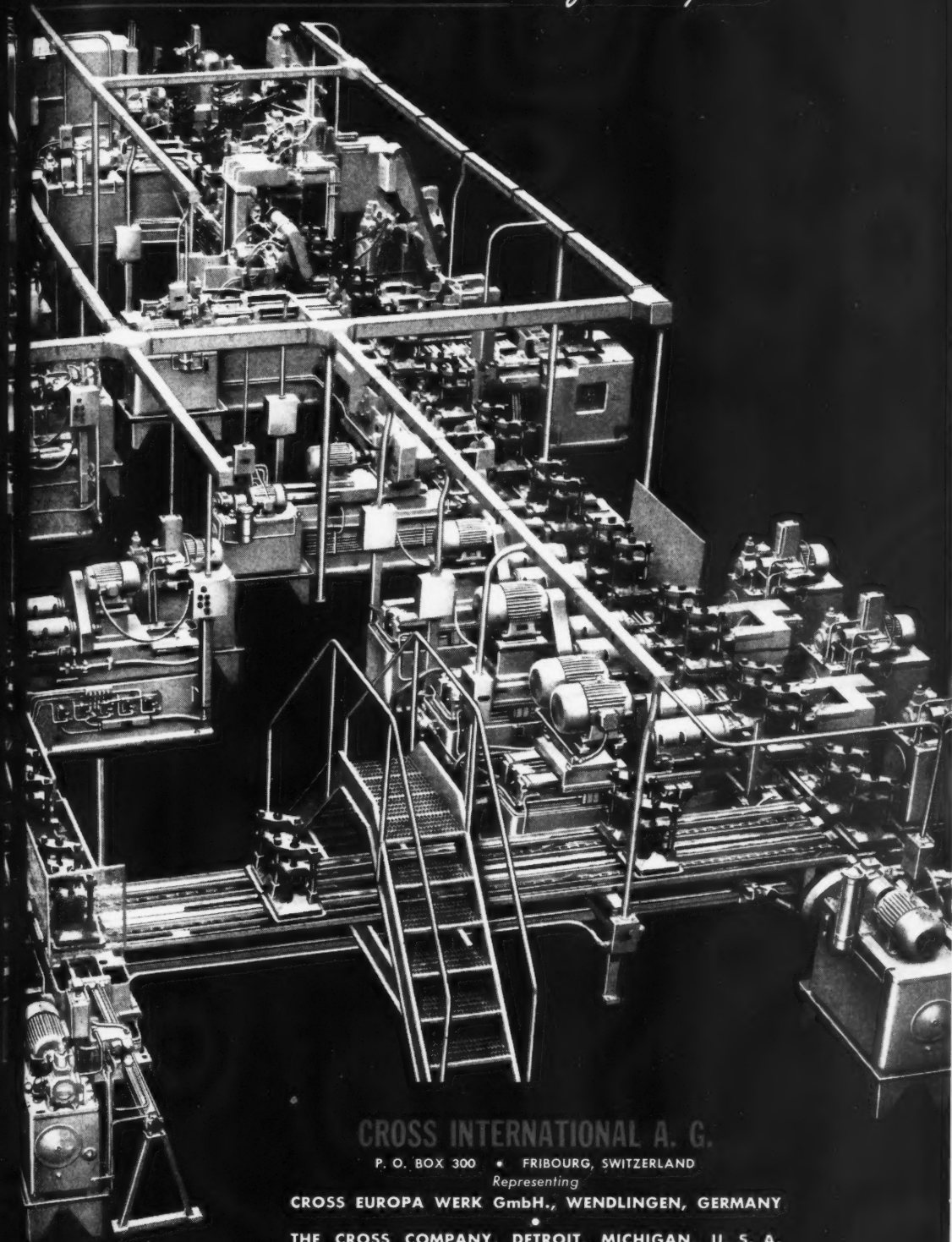
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Precision boring of the worm shaft hole—two at a time.



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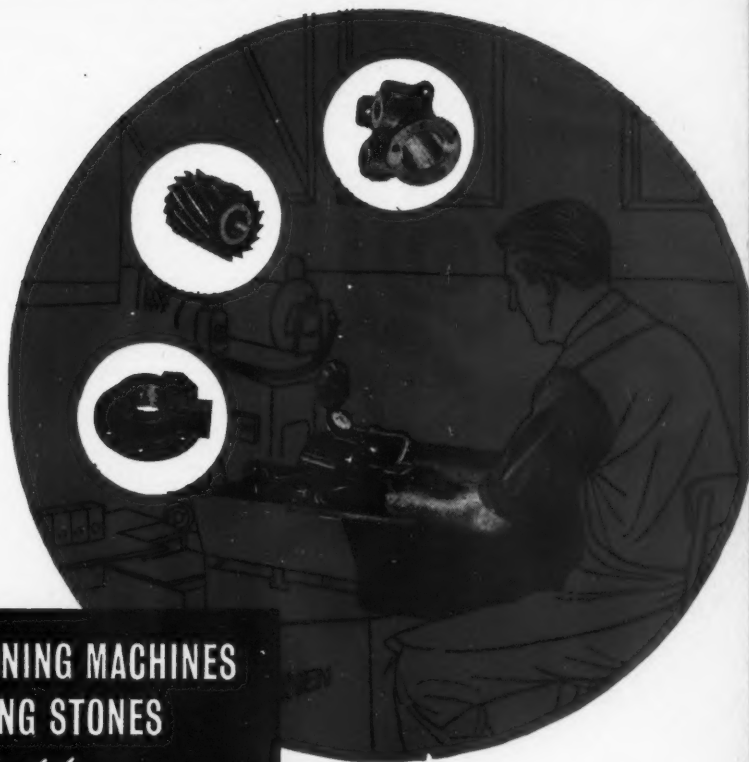
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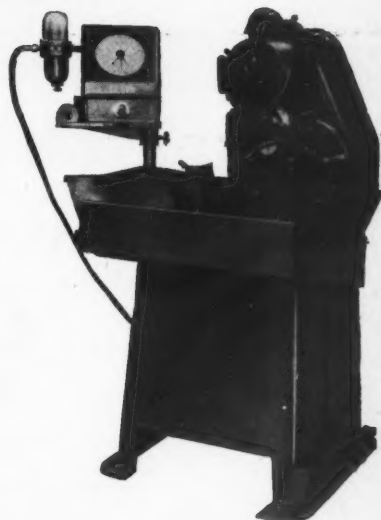


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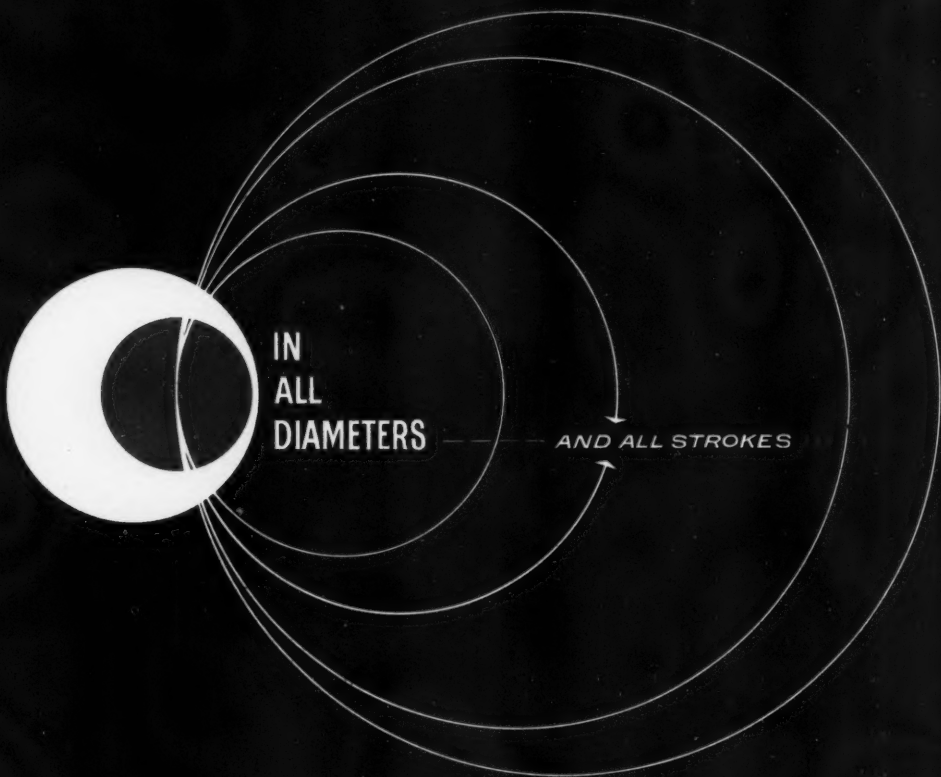
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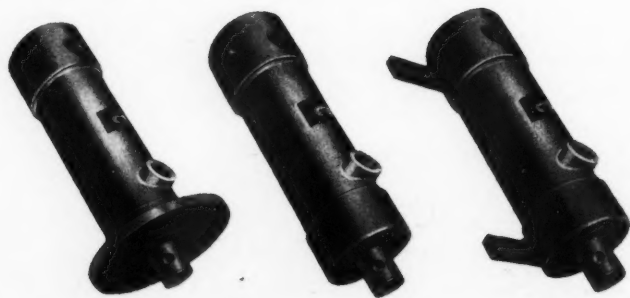
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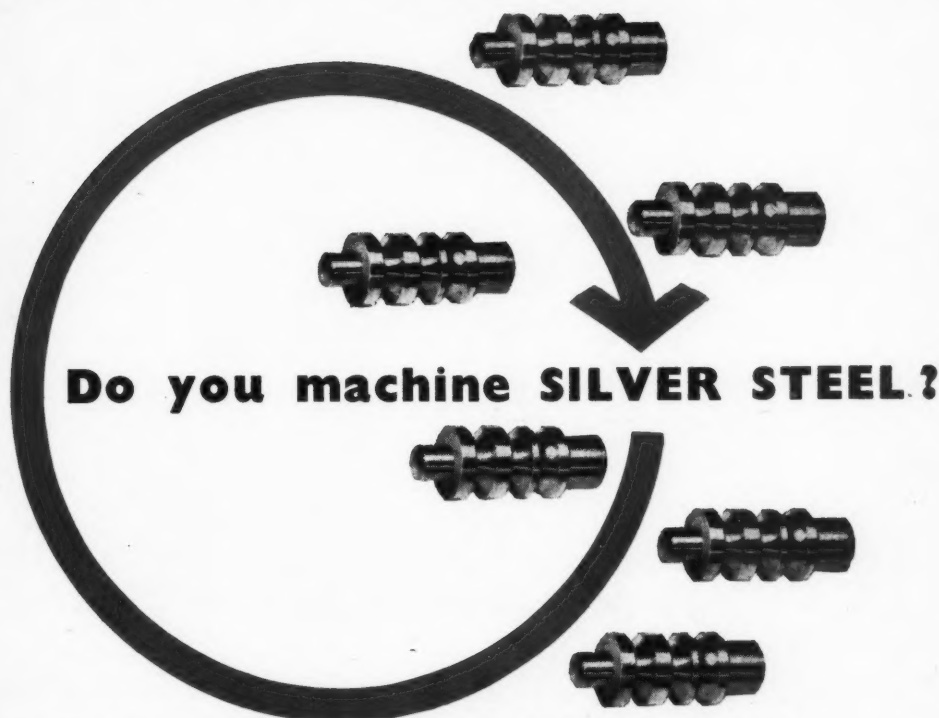


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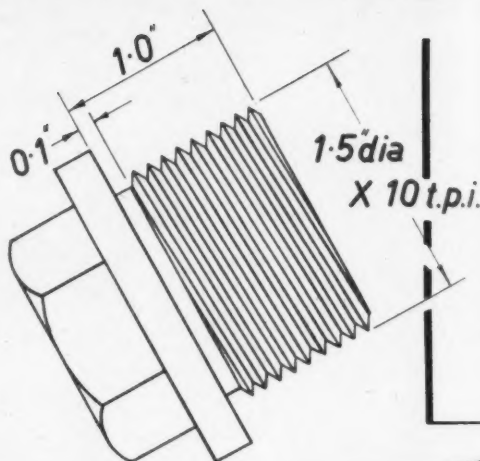
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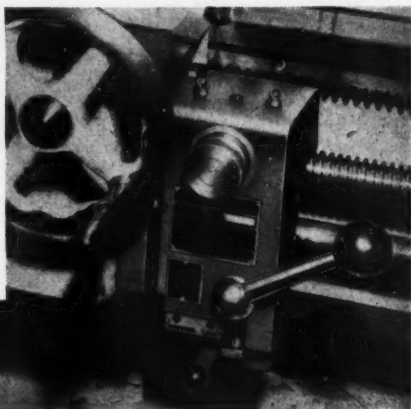


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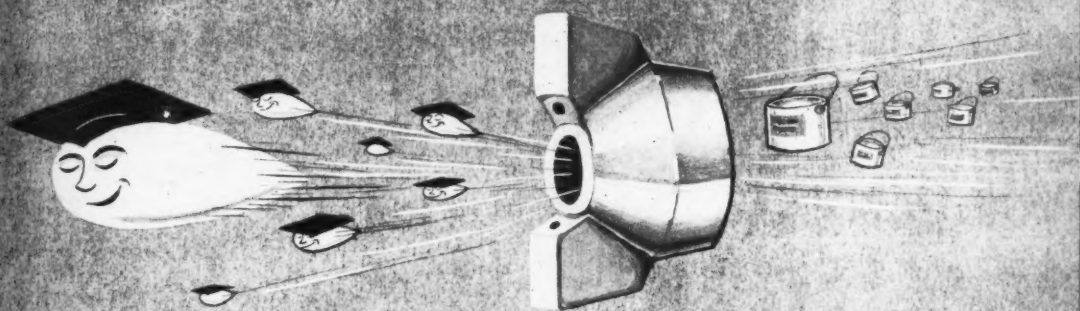
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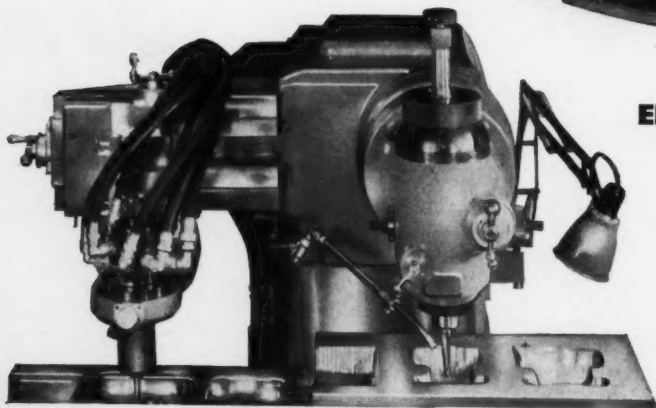
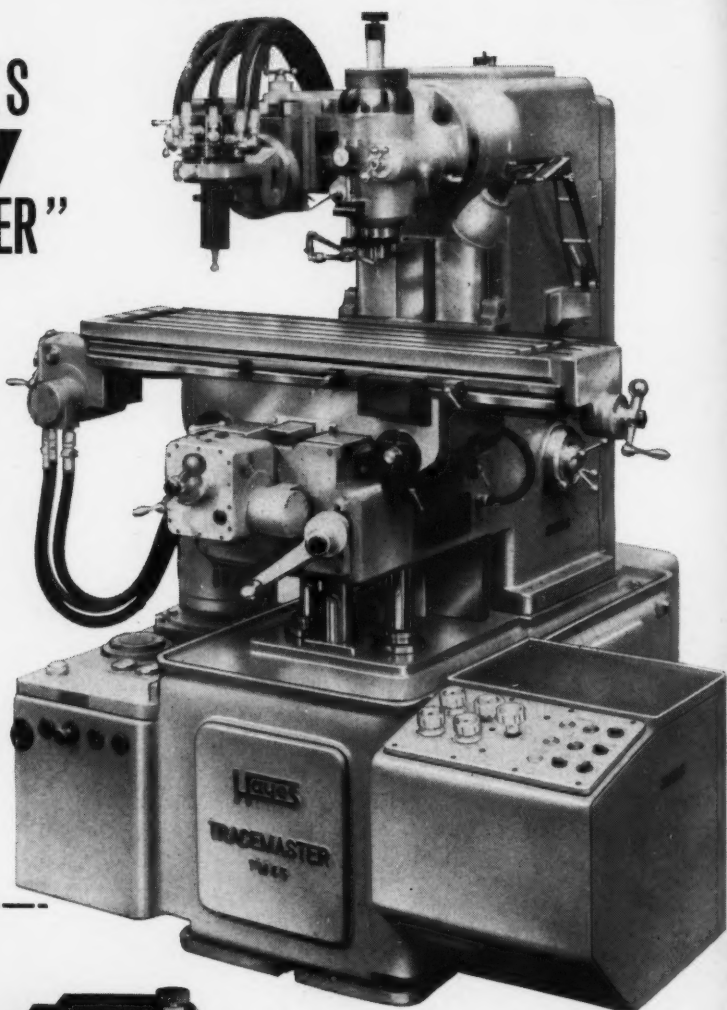
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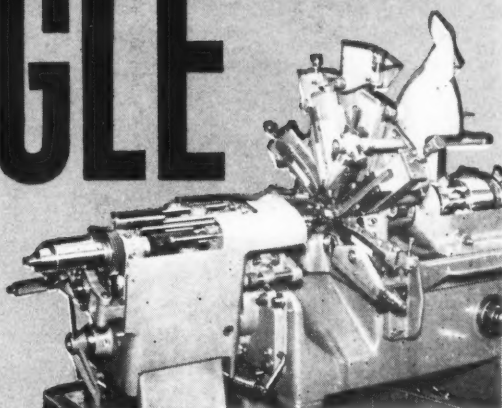
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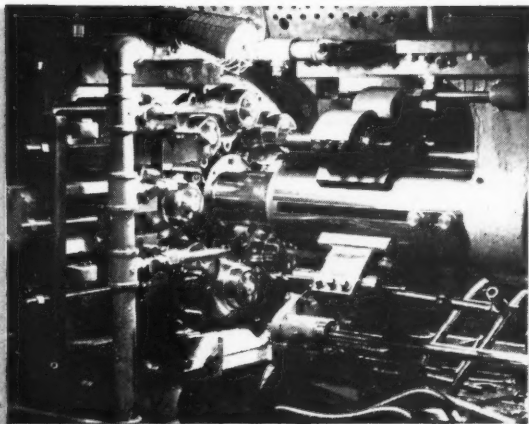
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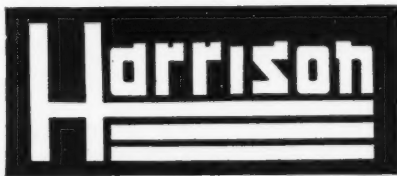
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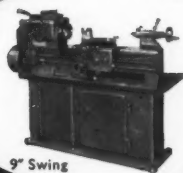
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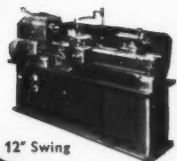


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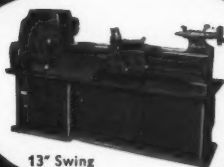
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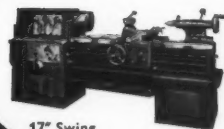
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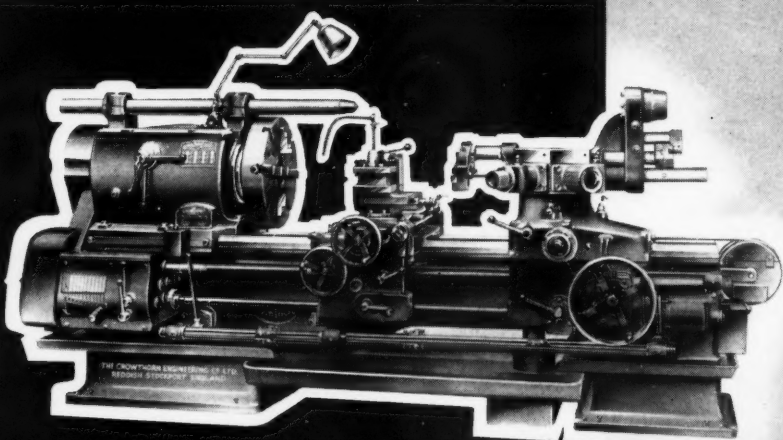
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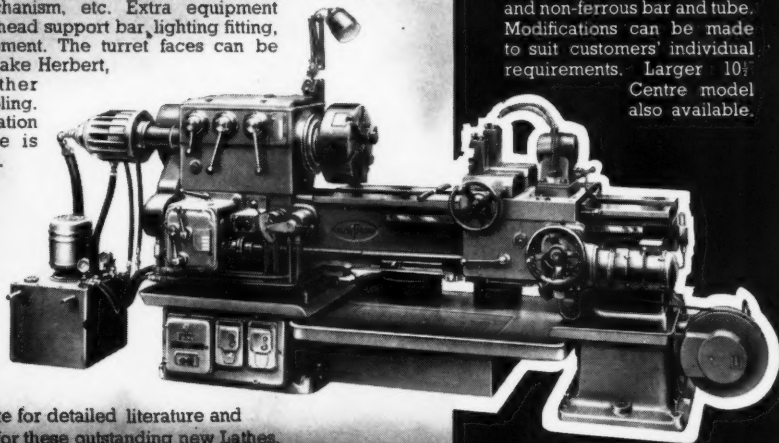
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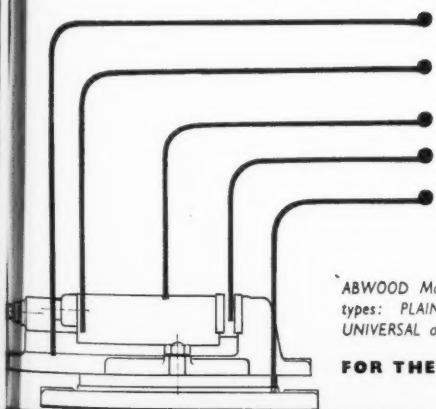
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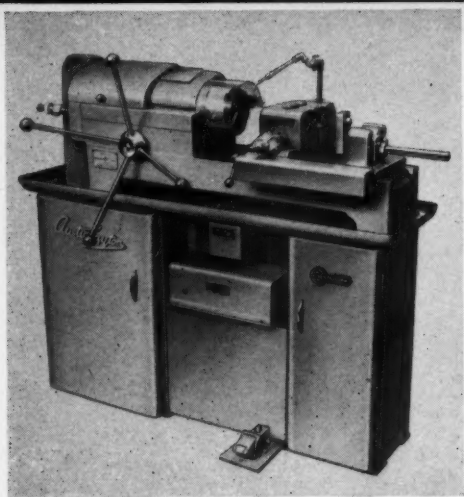


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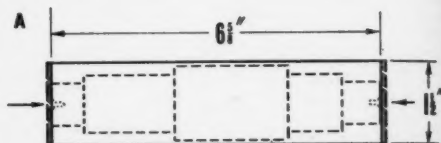
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Vol. 98, No. 2535

June 14, 1961



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Abstracts of Principal Articles

Making Petrol Dispensing Pumps P. 1332

At their Crayford, Kent, works, Vickers Armstrongs (Engineers), Ltd., manufacture a wide variety of products, including petrol dispensing pumps for garage use, which are made under contract from the Gilbert & Barker Mfg. Co., Ltd., U.S.A. One of the most important components for these units is the meter body, which is made from an aluminium die casting. After machining a recess and face on one side and a bearing housing and face on the other, on capstan lathes, the four cylinders of each body are fine-bored on a Precimax machine. Liners are machined from precision-drawn brass tube on a Ward capstan lathe, and are then pressed into the cylinders of the body on a specially-built Vickers semi-automatic machine. Meter bodies are then drilled and tapped on a group of Archdale and Herbert machines arranged in a closed loop. Two jigs are employed, each with indexing work supports, and are moved along a track connecting the machines. (MACHINERY, 98—14/6/61.)

The A.E.I. Turbine-generator Works at Larne P. 1350

The Larne works, Northern Ireland, of the Associated Electrical Industries, Ltd., came into operation in 1957, and in floor space is the second largest in the four factories maintained by the company for the production of turbines and generators. In this article, reference is made to the heavy machining section of the works, and various set-ups are described, for example, for milling turbine half-casings on a 300-ton Kendall & Gent plano-milling machine; turning blade grooves in turbine bucket wheels on a Richards machine with special tooling; copy-turning bucket wheels on another Richards machine; and copy-turning bellows-type couplings on a Webster & Bennett 48-in. vertical turning and boring mill. (MACHINERY, 98—14/6/61.)

Russian Automatic Transfer Machines at the Leipzig Fair P. 1365

The fourth of a series on Russian machine tools shown at the recent Leipzig Spring Fair, this article describes an automatic in-line transfer machine designed for operations on cast iron bearing caps for a diesel engine, which are machined from cluster castings in a cycle time of 44.5 sec. The partly-machined caps are fed to a milling unit at the first station, and then turned on to one side for the remaining operations which provide for drilling and reaming the bolt holes, milling oil seal-grooves, spot-

facing, chamfering, tapping, milling a joint face recess, and parting-off. To provide more time, the tools for drilling and reaming are duplicated, the operations being performed during two consecutive cycles of the remainder of the machine, and four different transfer bars are employed to index the work. At the milling stations, portions of the transfer track are mounted on brackets connected to hydraulic cylinders, whereby they are retracted to clear the milling spindle housings. Cycle control and tool control equipment is provided. (MACHINERY, 98—14/6/61.)

Equipment for Counting and Sizing Diamond Particles P. 1374

This article describes some of the equipment and procedures employed by Diadust, Ltd., one of the companies in the L. M. Van Moppes & Sons, Ltd., Group, for counting and sizing diamond powder, which is produced from board and is widely used in industry throughout the world. Of particular interest is an automatic particle size analyzer which has been developed by Casella (Electronics), Ltd., Haxby Road, York. With this unit, a specially prepared sample of the dust, of sub-sieve size, is scanned automatically and the counts obtained from three successive scanning runs are substituted for symbols in a simple equation, which when solved provides the number of particles contained in an area of 1 sq. mm. (MACHINERY, 98—14/6/61.)

Churchill Grinding Machines at the British Trade Fair, Moscow P. 1376

Three grinding machines, fitted with automatic work loading and size control equipment were exhibited by the Churchill Machine Tool Co., Ltd., Broadheath, Manchester, at the British Trade Fair held recently in Moscow. A type BW machine was fitted with a newly-designed loading unit of the swing-arm type which is mounted on the tailstock, and operates in conjunction with a work conveyor positioned at the tailstock end of the bed at right-angles to the work axis. The type HBM internal grinder exhibited incorporates a recently-developed face grinding head, which can be brought into operation as part of the automatic cycle, also a new work-loading unit fitted with a swing-type transfer arm. On the type EC centreless machine, there is a rotary-type work loading unit, also a feed-back system, which operates in conjunction with an air gauging unit. (MACHINERY, 98—14/6/61.)

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If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

The Significance of Missile and Space Vehicle Production

About 17 years ago, the first reliable information became available in this country concerning the design and performance of the V2 rocket weapon, and it was made evident how far ahead Germany was at that time in this particular field. The V2 rocket undoubtedly was a remarkable accomplishment for those days, from the standpoints both of design and construction, yet even when all the evidence was at hand it is unlikely that more than a very few people could have anticipated the astonishing progress that has already taken place and which appears virtually to have robbed us of the capacity for further surprise. In this connection it is only necessary to refer to the matter-of-fact reception which was accorded to recent pronouncements by the President of the United States. He spoke of the intention of his country to land a man on the moon and bring him back safely to earth before 1970, and whereas even 15 years ago such a suggestion would probably have been generally regarded as the wildest flight of imagination, today it seems to be widely accepted that this feat will be achieved by the U.S.A. or Russia, or both, within the period suggested.

Development of rocket engines, guidance systems, and constructional features of missiles and space vehicles has, of course, been very powerfully stimulated by military considerations—as was the original production of the V2—and such stimulus is likely to be augmented in the future by intense national rivalry in the field of scientific exploration within a widening area. Leaving aside all considerations of the effectiveness of long range ballistic missiles for offensive or deterrent purposes, it is impossible yet to forecast all the advantages that may accrue to humanity from the knowledge that has been gained, and will be gained, from the ability to put satellites of increasing size into orbit, and to undertake voyages with manned or unmanned vehicles further and further into space. Even if much of this knowledge cannot be turned to practical account, it is inevitable that the process will continue now that the first steps have been successfully taken, and it would be rash to predict how far progress may have been taken by the end of this century.

It is already evident that only countries or groups of countries with great industrial resources could reasonably put forward the effort in the fields of research and production that any substantial space vehicle programme demands. Only those

most intimately concerned can appreciate the full extent of the problems to be overcome before a manned landing on—and return from—the moon can be undertaken, for example. The return voyage, considered in isolation, will surely be difficult enough. Obviously the production of successful vehicles for such purposes will demand much more exacting standards than have previously been achieved. Many important advances have already been made in connection with the development of materials for various purposes in order to obtain the necessary strength-weight ratios, heat-resistance, and other properties that may be demanded, and much further progress in these directions may be anticipated. Similarly, new designs and methods of construction are the subject of intensive investigation with the object of progressively reducing structural weight while maintaining adequate strength. For many of the internal components and mechanisms, moreover, exceptional degrees of accuracy are essential, in conjunction with minimum size compatible with satisfactory functioning.

Above all, a degree of reliability must be ensured beyond anything that has been attempted hitherto. Although most or all of the vehicle or missile is expendable, and the working life of many parts may be very short, so complex is the whole that the possibility of error in each section must be reduced almost to vanishing point. To guarantee such dependability it may not suffice to rely on particularly searching inspection procedures, but it may be necessary to adopt a new approach and to bring a more highly developed sense of responsibility to bear at every stage of manufacture.

The development of quantity production methods in metal working, in which the motor car industry has consistently played such a prominent part, has had far reaching effects in many other branches of manufacture and incidentally on the living standards of the populations in all industrialized countries. More recently the requirements of aircraft construction, particularly since the gas turbine was introduced during the last war, have encouraged the development of improved materials and techniques of metal working which are already finding much wider application. Attention may be drawn, for instance, to the quantity production of titanium, which was

(Continued on page 1386)

Making Petrol Dispensing Pumps

Methods and Equipment Employed by Vickers Armstrongs (Engineers), Ltd., Crayford, Kent, for the Production of Metering Pump Bodies and Cylinder Linings

By P. A. SIDDERs, Chief Associate Editor

THE NUMEROUS COMPANIES within the Vickers group include Vickers Armstrongs (Engineers), Ltd., which has works located at Barrow-in-Furness, Newcastle-on-Tyne, Weymouth, Dartford, and Crayford. Vickers had an interest in a works on the site of the present plant at Crayford, Kent, prior to 1897, when the company was known as Vickers, Sons & Maxim, Ltd. Before the 1914-1918 war, the products of the Crayford works included automatic guns and the Wolseley motor car. During that war, the factory was occupied with the construction of aircraft, and by 1918, the number of employees at Crayford had risen to 12,000. It may be mentioned that the company built the S.E.5a fighter aircraft complete—engine, airframe and armament—at these works. Subsequently, the Vickers Vimy heavy bomber was produced, and one of the old hangars is still used as a heavy assembly shop.

After the first world war, the company had to find non-military outlets for the production capacity, and motor vehicle bodies were produced at Crayford. From 1921 to 1927 more than 12,000 motor car bodies and 1,000 commercial vehicle bodies were made, and later the Vickers Aussie tractor was built. In 1931, the plant and production activities of the neighbouring Erith works were transferred to Crayford, and during the 1930's, the latter factory was concerned with the building of fire-control equipment for naval and land-base use, box making machines, and hardness testing machines, in addition to the Vickers machine guns of 0-303 and 0-500 calibre, the production of which had continued from the war period.

The number of employees rose to 10,000 during the second world war, and the Crayford works was engaged in building fire control equipment and machine guns, also multiple 2-pounder pom-pom guns for naval use—the well-known "Chicago piano." With the cessation of hostilities, the demand for armaments fell off sharply, and a variety of commercial products was introduced. The Crayford factory has undertaken the building

of plant for bottling beer and soft drinks, other brewery plant, butter processing machinery, paint processing equipment, packaging machinery, box making plant (including wire stitching and forming machines), hardness testers, a range of light-duty Clearing presses of 22, 32 and 45 tons capacity, and the petrol pumps with which this article is concerned, in addition to a certain amount of fire control equipment. During the post-war period, the company also produced a large volume of mechanical and electrical data processing equipment for the Powers Samas company, and still makes the P.C.C. electronic computer for I.C.T., Ltd.

There are now some 3,000 employees at the Crayford works, which has 1½-million sq. ft. of covered floor area, some of this space being in multi-storey buildings. The facilities include a foundry (with a capacity of 120 tons per month), a forge, and machining and assembly shops. There is a well-organized apprentice school, which will form the subject of a future article.

The petrol pumps made at the Crayford works are built under an agreement between Vickers Armstrongs (Engineers), Ltd., and the Gilbert & Barker Mfg. Co., Springfield, Mass, U.S.A., who are associated with the Standard Oil Company of New Jersey. These pumps are sold by Gilbarco, Ltd., and are produced at a rate of several hundred per month, many thousand having been completed to date at the Crayford works. A typical pump is seen in the heading illustration, and there are numerous variants of the basic design, which include, for example, pumps with and without radial arms, with and without lighting; and with and without Calcometer units to show the total cost of the petrol dispensed. Pumps are made for a variety of currencies and measuring systems,



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since they are exported in substantial quantities.

All the pumps are electrically operated and each incorporates a vane-type main unit which delivers petrol to a 4-cylinder meter unit. The latter serves to drive the calculating unit, supplied by Veeder-Root, Ltd., which determines and indicates the total volume delivered and its cost. Pressed steel components for the pump casing are made principally at the Crayford works and the Vickers Armstrongs Dartford factory, but certain pressings are obtained from an outside supplier.

OPERATIONS ON METER BODIES

The metering unit is one of the most important sub-assemblies in a petrol pump, since it is required by the Board of Trade to measure to an accuracy of $-0, +1$ fl. oz. per gallon. In the pumps made by Vickers Armstrongs (Engineers), Ltd., the metering units have die cast, aluminium alloy casings, each with four radially-disposed cylinders. Pistons are moved to and fro in the cylinders by the petrol delivered from the main pump, and impart rotary motion to a central shaft by means of cams. A valve directs petrol to each cylinder in turn, and the driven shaft is connected to the calculating unit mounted above. Die cast casings are supplied by an outside foundry, and a casing as received at the Crayford works is seen at the left in Fig. 1. It will be observed that the casting is of cruciform configuration with four similar arms, which are cored, as at A, to form the cylinders. There are numerous smaller cored holes, which are subsequently machined, to receive fixing screws and other members when the pump is assembled.

The first two operation stages in the machining sequence on meter bodies are carried out on Herbert No. 7 turret lathes. For the first stage, the casting is located on a fixture by a spigot that engages the cored recess B, which is subsequently machined to receive a part known as the "carbon deck." The casting is secured by strap clamps at either side, which are engaged with cored holes, as at C, in two opposed arms. At this machining stage,

a large cast boss, indicated at D, is bored to receive a ball bearing, and this boss, also a service pad, as at E, on the cylinder head flange at the end of each arm, are faced. A dimension of 4.0865 in. ± 0.001 in. is maintained from the pad faces to the die cast surface of the carbon deck seating.

For the second operation stage, the casting is loaded into a fixture whereon it is located by a spigot that is engaged by the previously-bored hole in the boss D, with the machined pads on the cylinder head flanges in contact with the face of the fixture, and is secured by strap clamps that enter the cored holes in two opposed cylinders. At this stage, the carbon deck seating is machined to 4.0605 in. ± 0.001 in. from the service pads, and the surrounding flange is faced. The cored hole in the centre of the carbon deck seating is bored to receive a ball race, and the outer end is threaded 1-in. diameter by 16 t.p.i. Whitworth, as seen at F, in the component at the right.

FINE-BORING CYLINDERS

A brass liner is inserted in each cylinder bore, as will be described later, and the next operation in the machining sequence provides for fine-boring each cylinder to ensure the necessary close fit. In Fig. 1, a fine-bored casting is seen at the right, and a dimension of 2.224 in. ± 0.001 in. must be maintained between the axes of the bores and the carbon deck seating face.

Fine-boring is performed on the single-ended, 2-

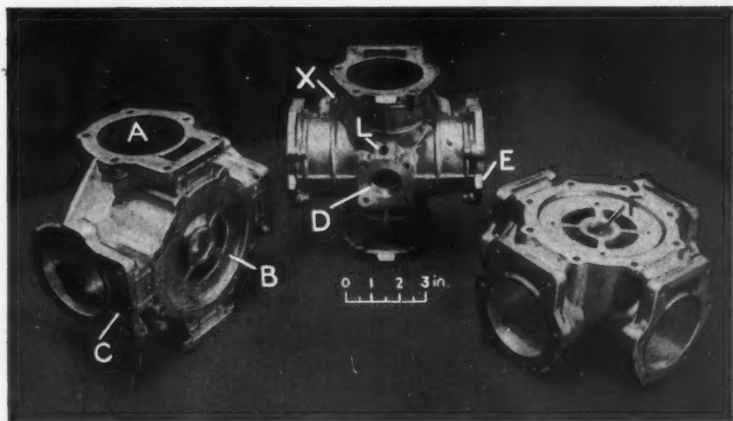


Fig. 1. A die casting for a meter body, as received by Vickers Armstrongs (Engineers), Ltd., is seen at the left; a casting after fine-boring, at the right; and a casting with the cylinder liners inserted and machining completed, at the centre

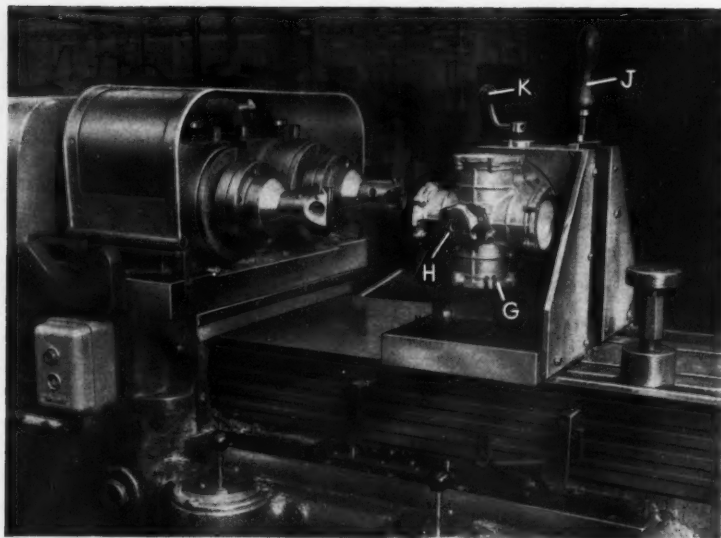


Fig. 2. The set-up for fine-boring the cylinders of meter bodies on a 2-spindle Precimax machine, equipped with a double-sided indexing fixture

spindle, Precimax machine shown in Fig. 2, a double-sided indexing fixture being mounted on the table. A workpiece, as seen at G, is loaded on to a platen at each side of the fixture, which has a cast-iron body of T-shape, braced with steel plates. The workpiece is located on the platen by a spigot which engages the previously-machined carbon deck recess, also by a peg which enters a cored hole in the surrounding flange. Thus located, the casting is retained by a C-washer and clamp nut H, on a stud that passes through the central bearing bores. Care must be taken by the operator to ensure that the clamping force is not excessive, otherwise the fine-bored hole will distort when the clamp is released.

The two platens of the fixture are mounted on a common axis, and are indexed together to any of four settings, at 90-deg. intervals. These settings are governed by holes in the flange at the front of the fixture, which are engaged by a sliding plunger. The plunger is thrust into engagement with the holes by a spring, and is withdrawn by means of the lever J. After the plunger has been withdrawn, the work is swung to the new setting by hand, and a clamp is applied by the lever-screw K in order to damp out vibration during cutting.

Boring bars of very rigid construction are mounted on the spindles of the Precimax machine, and each has a slot wherein a single-point tool in-

sert is clamped. The inserts, which are supplied by English Steel Tool Corporation, Ltd., are of L-shape, with the shorter limb extending outwards from the bar, and a tip of Escaloy tungsten carbide is brazed at the outer end of each short limb. Of rectangular shape, each tip has a chip-breaker groove, parallel with the front edge (that is, radial to the bar axis), and is diamond ground and diamond lapped to a high finish. It is very important that there should be no tool return mark along the bore, since petrol is extremely penetrating, and such a mark could form a passage between the liner and the cylinder wall along which seepage might occur. At the end of each boring traverse, therefore, the machine is stopped, and the spindles are turned by hand, until an engraved line on each is aligned with an index mark on the front bearing retainer of the spindle head assembly. As a result, the tool is set in the top dead centre position, and the steady clamp of the fixture is then released. The operator next disengages the locating plunger, by means of the lever J, and turns the work slightly, so that the bore that has just been machined is inclined relative to the boring bar, with the outer end above the horizontal. With the cylinder in this setting, the work can be moved clear of the bar, without a tool return mark being formed in the bore.

For the fine-boring operations, the machine spindles are run at 950 r.p.m., and the table is advanced at a feed rate of 3 in. per min. Each bore is 2½ in. deep, and is machined to 2.821 in. -0, +0.0008 in. diameter.

MACHINING CYLINDER LINERS

A cylinder liner is seen at L in Fig. 3, where it is resting on the cross-slide of the Ward 3A capstan lathe employed for machining the ends. Liners are machined from precision-drawn brass tube, and each is faced at both ends to a specific length.

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One end is machined with a 45-deg. internal chamfer and a 15 deg. (a side) external chamfer, which serves as a lead-in, when the liner is assembled with the cylinder bore.

For the operations on the Ward lathe, a pre-cut length of tube is mounted on the expanding stub-arbor *M*, which has been fitted to the machine by Vickers Armstrongs (Engineers), Ltd. The arbor *M* has three pads, of arcuate section, which are mounted on a tapered member *N*, and held in place by a spring-steel circlip *P*. Each pad has a flange at one end, which is engaged by the flange of the nose cap *R*. This cap is screwed on to the end of the ball cage that forms part of the operating mechanism for the dead-length collet chuck normally fitted to the Ward lathe*, the cage being bolted to the mounting flange on the machine spindle.

The stationary outer casing *S*,

* This unit is fully described on p. 57 of "Capstan and Turret Lathe Practice," in MACHINERY'S Standard Reference Series.



Fig. 3. This internally-expanding work support for brass cylinder liners has been fitted to a Ward capstan lathe by Vickers Armstrongs (Engineers), Ltd., and is actuated by the standard hand-operated collet mechanism

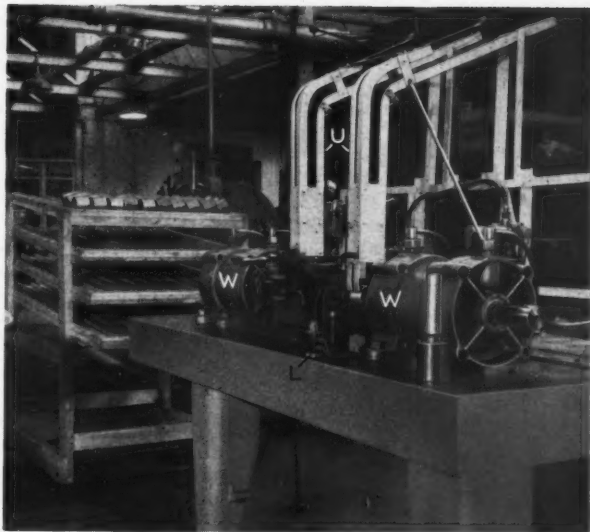


Fig. 4. General view of the special air-operated machine for pressing liners into the cylinders of meter bodies. During a semi-automatic cycle, two liners are inserted, the work is indexed, and two further liners are inserted

secured to the machine headstock, is fitted with pins and guides that engage helical slots in a rack case. Gear teeth cut on the periphery of the rack case are engaged by a pinion actuated by the lever *T*, and the case can thus be partially rotated. As the case is turned, it is displaced axially by the action of the helical slots and the guides, and a ball-operating sleeve, carried between thrust bearings within the case, is also moved. In consequence, an annular groove in the sleeve engages and moves inwards balls that are housed in the ball cage, and these balls thrust an inner sliding sleeve forwards. This sleeve normally closes a dead-length type collet, but is here coupled to the tapered member *N*, which is moved axially to expand the three pads of the arbor *M*, within the bore of the workpiece. By moving the lever *T* in the opposite direction, the balls are allowed to move outwards, and the sleeve and tapered member are moved back by the action of a spring, so that the three pads of the arbor *M* are contracted, and the workpiece is released.

As each liner is unloaded from the Ward lathe, it is placed in a special trolley-rack at one side of the machine. This rack may be seen in the background in Fig. 4, and it has four sloping shelves, which are divided into channels by wooden strips.

As each liner is placed in a channel, it rolls down towards the lower end of the shelf, and the channels and shelves are filled successively. When the rack has been completely filled, it is moved on its wheels to the position shown, whence liners can be readily removed from the lower end of each shelf by the operator of the liner-inserting machine in the foreground of the figure.

LINER-INSERTING MACHINE

The liner-inserting machine has been designed and constructed by Vickers Armstrongs (Engineers), Ltd., and is semi-automatic in operation. Built on a large cast-iron surface plate, the machine is operated by compressed air, at a pressure of 80 lb. per sq. in., and incorporates pneumatic valves and cylinders supplied by Baldwin Instrument Co., Ltd., Dartford, Kent.

Liners are loaded into the two magazine chutes *U*, with their externally-chamfered ends inwards. The stack of liners in each chute is urged towards the lower end by a cylindrical steel weight, which is placed in the chute at the upper end of the stack. This weight has a central annular groove to which is attached a length of thin, flexible steel cable, the other end of this cable being secured to a small bracket at the extreme upper end of the chute. When the stock of liners in the chute needs to be replenished, the operator can readily withdraw the

weight by means of the cable. The lowermost liner in each chute rests in V-section guideways in a block at one side of the box-type work-fixture on the bedplate. Liners in this position are indicated at *V* in Fig. 5, and are aligned with holes in the side of the fixture, also with the rams of air cylinders of 9 in. bore, seen at *W* in Fig. 4 and 5.

The fixture is constructed from steel plate, and the liners are an easy sliding fit in the hole in each side wall. A circular plate is free to rotate in the fixture base, and incorporates a shallow spigot of a diameter to suit the carbon deck recess, also a peg for angular positioning of the work. This method of location is the same as that employed on the fixture fitted to the Precimax fine-boring machine. The work is held on the circular plate by means of a spring-loaded plunger *X*, Fig. 5, fitted to the perforated-metal lid *Y* of the fixture, this lid being mounted on a bar that is pivoted on the rear wall of the unit. Perforated metal is employed for the lid to permit the operator of the machine to observe the work, if needed. The support bar extends beyond the front of the lid, and when the latter is closed, the bar trips the lever-operated valve *Z*, mounted on the front wall of the fixture. Unless this valve is tripped, the machine cannot operate, and the lid is held closed by a spring-loaded catch, which engages an angular step-face on the bar. The engagement of the catch can be adjusted by the knurled nut *A*, and this nut also serves for withdrawing the catch to enable the lid to be opened.

Before a metering unit body is placed in the fixture, shellac varnish is applied to all four cylinder bores to eliminate any possibility of petrol seepage. The arrangements for applying varnish will be described later.

Once the lid of the fixture has been closed, the machine operates on an automatic cycle, and the pistons of the two cylinders are advanced simultaneously. On the end of each piston rod is fitted a thrust block, as at *B*, which is of cylindrical form, with an integral flange about midway along its length. The front end of the block is machined to receive a transverse bar *C*, of square section, and has a small angular face at the top. As each piston is advanced, the thrust block engages the lowermost liner in the stack and pushes it along the guideways, through the hole in the fixture wall and into the cylinder bore at one side of the metering valve

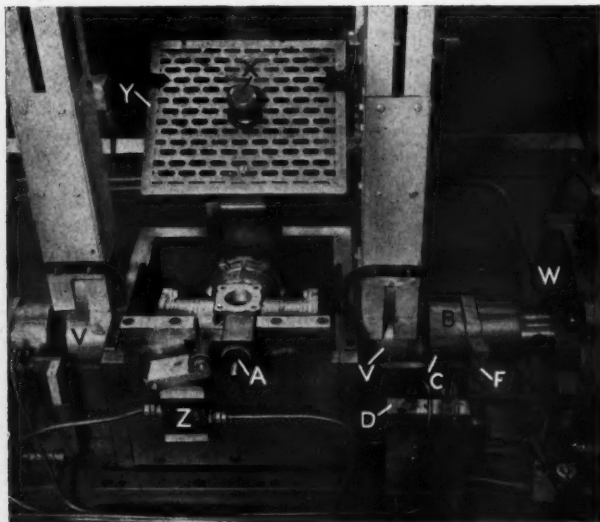


Fig. 5. The fixture for meter bodies and the ends of the magazines for liners on the semi-automatic inserting machine

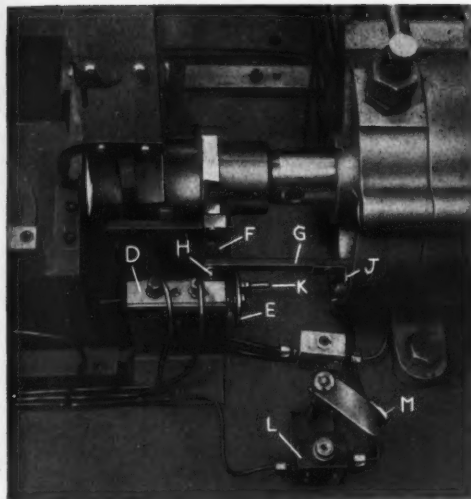


Fig. 6. The thrust block, trips, and control valves at one side of the liner inserting machine can be clearly seen in this close-up view

body. The chamfer on the leading end of the liner not only facilitates entry into the cylinder bore, but also forms an annular recess at the inner end of the cylinder to receive excess shellac varnish that is forced along the bore.

Movement of the thrust block inwards is limited by the transverse bar *C* coming into contact with the side wall of the fixture. During this movement, the remaining liners in the stack are lifted slightly by the angular face at the front end of the block, and rest on its upper surface.

CYCLE CONTROL ARRANGEMENT

It may be noted that the machine is arranged for pilot-valve control, the main valves whereby air is supplied to the two operating cylinders being mounted on the frame at the rear of the base. The valve *Z*, to which reference has already been made, is incorporated in the pilot circuit, and at either side of the fixture there is a reversing pilot valve, as seen at *D*. This valve is also shown in the close-up view, Fig. 6, and on the end of the spool is mounted a disc-type striker *E*.

The flange of each thrust block carries a vertical bar *F*, which travels along the outside of the V-section guide block. An L-shaped plate is secured to the bar *F*, by screws which pass through the shorter vertical limb of the L-form. The longer, horizontal, limb, seen at *G*, carries a fixed dog *H* at one end. At the other end there is a second dog *J*, which is secured by a domed-head screw that passes through a slot. This dog is so positioned that it engages the striker *E* and resets the valve *D* at the end of the inward movement of the thrust block. In consequence, the main valve connections are reversed, and the thrust block is moved in the outwards direction, until the dog *H* contacts the striker *E*. The valve *D* is then returned to its original setting and the next inward movement is initiated. Adjustment is provided for the dog *J* to allow for the slight time lag between the tripping of the pilot valve and the reversal of the air supply to the operating cylinder by the main valve.

At its lower end, the bar *F* (on the right hand side of the machine only) is forked, and embraces a connecting-rod *K*. This rod passes through the side-wall of the fixture and serves to actuate a pawl and ratchet mechanism in the fixture base, whereby the circular work-support plate is indexed through 90 deg. At the end of each outward movement of the right-hand thrust block, the bar *F* contacts a nut and moves the rod axially. Timing of the in-



Fig. 7. An automatic dispensing unit built by Vickers Armstrongs (Engineers), Ltd., for applying shellac varnish to cylinder bores before the liners are inserted. A pump body with the liners assembled is seen at the left

dexing movement is effected by adjusting the nut along the threaded end of the rod. Dogs, fitted to the work-support plate, trip a pilot valve at the rear of the fixture to stop the machine after two indexing movements have been completed. The reversing valves at either side of the machine then remain inoperative until the next cycle is started by closing the lid and tripping the valve Z, Fig. 5.

A valve L, Fig. 4 and 6, serves as a master control. The machine operates as long as the operating plunger of this valve is held down, and the plunger is depressed by hand for setting and similar purposes. When the machine is to operate on an automatic cycle, the plunger is held down by a thumb-screw M, carried in a swinging arm on a pillar fitted to the machine base.

VARNISH APPLICATOR

Fig. 7 shows the unit that has been designed and made by Vickers Armstrongs (Engineers), Ltd., to facilitate the application of varnish to the cylinder bores of the meter body. A component, after the brass liners have been inserted, is seen at the left. The varnish is composed of shellac dissolved in methylated spirit, and a supply of approximately $\frac{1}{2}$ pt. is contained in the reservoir N. Supported by

a spring P, the reservoir is free to slide on a pillar that projects vertically from a base, which is screwed to a bench adjacent to the bush inserting machine. At the top of the pillar is mounted a steel disc which supports a $\frac{1}{2}$ -in. thick pad S, comprising a circular piece of sponge rubber, sandwiched between two fabric discs. The end of the pillar passes through the pad, which is secured by a large steel washer and a set screw.

Normally, the reservoir is supported by the spring so that it completely encloses the pad, which then lies within the varnish in the reservoir, but it has been set in the position shown for purposes of illustration. The upper end of the reservoir is machined to form an outer annular seating face and an inner register spigot T, of truncated conical form. Each cylinder of the meter body is located over the spigot in turn, and is first centralized by engaging the bore with the spigot. The meter body is then pressed downwards, and the reservoir is thus thrust vertically down the pillar so that it moves clear of the pad S, which is charged with varnish. As the bore of the spigot passes over the pad, the latter is compressed slightly, to remove excess varnish, and when the pad is freed from the spigot it expands into contact with the cylinder bore of the meter body.

During the remainder of the downward motion, the wall of the bore slides over the pad and is coated with a thin layer of varnish.

The travel of the reservoir is such that the meter body stops with the pad $\frac{1}{4}$ in. clear of the inner end of the bore. Since the spigot extends into the bore for $\frac{1}{4}$ in., there is a similar band that is free from varnish at the outer end of the bore. At the completion of the downward movement, the meter body is raised, and the reservoir rises with it until the pad is once more fully enclosed, the pump body then being lifted clear. All four cylinder bores are coated with varnish in this manner before the meter body is passed for bush insertion.

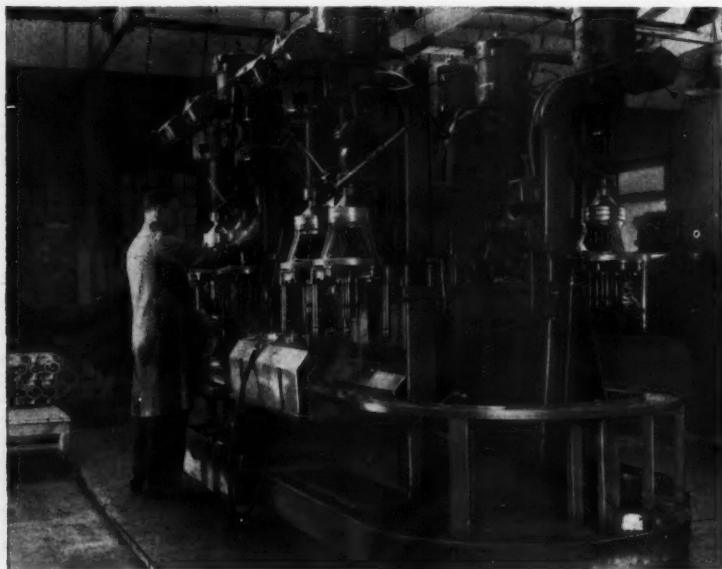


Fig. 8. This group of machines connected by a closed-loop trolley-jig track provides for drilling and tapping holes in the meter bodies after the liners have been inserted

CLOSED-LOOP DRILLING AND TAPPING LINE

From the bush inserting machine, meter bodies are loaded on to stillages with castoring wheels, whereon they are transferred to a group of machines that provide for drilling and tapping various holes. A general view of the installation is given in Fig. 8, and it will be seen that the machines are arranged in two rows, back to back. There are two twin-spindle Archdale machines, with a single-spindle Herbert machine between them, in the row at the left in the illustration, and the other row consists of two twin-spindle Archdale machines. The tables of the machines are arranged at a common height and support an oval track, the ends of which are mounted on pillars. This track provides for the movement of two trolley-type jigs, which are coupled together and are transferred from machine to machine by the operator, who moves round a wooden plinth.

All the spindles of the Archdale machines at one side, and three of the spindles of the machines at the other side, are fitted with multi-spindle heads, which are of adjustable-centre type, made by an outside supplier to Vickers' specification. Each head is fitted with two long cone-ended guide pillars, which enter bushed holes in the jigs. The pillars are disposed diagonally, and on the heads employed for drilling operations, they also serve to support a spring-loaded bush plate.

The two jigs differ in design, but each has three rollers—one at the front and two at the rear—that run on the angle-section rails of the oval track. On account of the 3-point support thus formed, the spacing of the rails is narrower at the semi-circular ends of the track than it is at the sides.

DRILL JIG DESIGN

As indicated above, the two jigs employed on the closed-loop line are coupled together, and for convenience will be referred to as the leading and trailing jigs. A meter body is first loaded into the trailing jig of the pair, and a view of this unit is given in Fig. 9. At the rear of the jig base there is a bearing bracket which carries a circular work-support plate, just visible at U. This plate incorporates a spigot, with which the carbon deck recess of the meter body is engaged, also two fouling pins V and a fork W, the latter being secured by screws in a slot in the edge of the plate. When the meter body is loaded, the fork ensures that it is located in the jig at the correct angular setting for subsequent drilling and tapping of the hole X, Fig. 1, in a broad web between two of the cylinders.

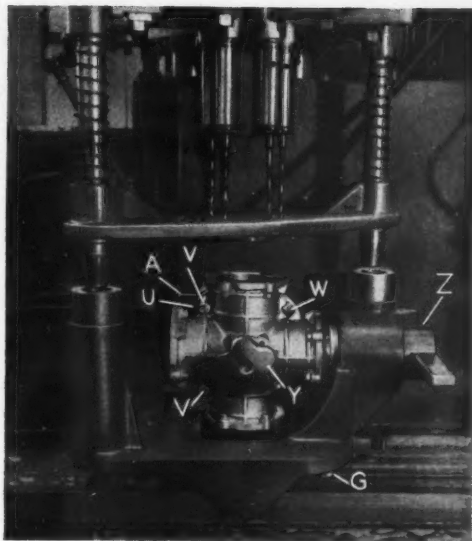


Fig. 9. The trailing jig of the pair used for drilling and tapping meter bodies. This jig provides for holding the body while holes are machined in each cylinder head flange, also at an angular setting between two cylinder positions

The meter body is held on the support plate by the hand nut Y, Fig. 9, which engages the thread on a stud that passes through the centre. To facilitate loading, the nut has a clearance hole (slightly larger than the major diameter of the thread) machined at a small angle to the tapped hole, and co-axial with it at the inner end of the nut. The tapped hole is accurately square with the inner face of the nut, which bears against the work, and when the nut is assembled, it is tilted slightly so that it can be passed easily over the stud by way of the clearance hole. As the end face is thrust against the mating face of the work, the nut is realigned square with the stud, and the partial threads engage those of the stud. It is then only necessary to give the nut about half a turn to clamp the component securely on the support plate.

Drilling and tapping of the holes in the cylinder head flanges, also in the web, are performed with the work in the trailing jig. For operations on the cylinder head flanges, the work is located by a large plunger Z, at one side, which is moved by a lever pivoted at the rear of the jig frame. This plunger is engaged with each cylinder bore in turn, for operations on the flange of the cylinder

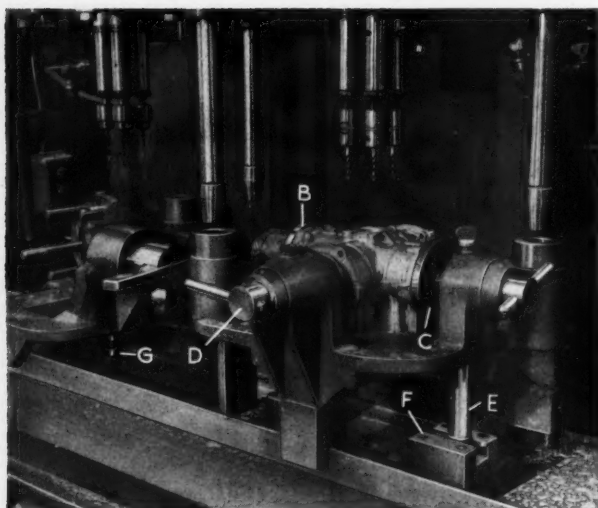


Fig. 10. The leading jig of the pair on the closed-loop machine line. This jig provides for drilling and tapping operations on the small bearing boss at one side of the meter body, and the carbon deck face and flange on the opposite side

that is then positioned vertically. For drilling and tapping the angular hole (X, Fig. 1), the component is positioned by a smaller sliding plunger at the rear of the jig. This plunger is actuated by a lever A, and enters a hole in the work-support plate.

The leading jig of the pair is seen in Fig. 10, and provides for operations on the holes associated with the carbon deck and the bearing boss (D, Fig. 1). At opposite sides of the jig there are bearing brackets carrying a spigot B, which is free to rotate but is restrained axially, and a spigot C, arranged both to rotate and slide. A meter body is loaded with the cylinders in a horizontal plane, and one cylinder bore is engaged with the spigot B. The spigot C is then advanced to engage the cylinder bore on the opposite side of the work, and can be locked axially by a thumb screw. At the front of the jig there is a sliding plunger to engage the cylinder bores, the end of which is indicated at D. This plunger is engaged with one of the two remaining cylinder bores to hold the work horizontal with the bearing boss uppermost. When required, the plunger D can be withdrawn, the component swung through 180 deg. about the spigots B and C, and the plunger re-engaged with the fourth cylinder bore, to locate the workpiece with the carbon deck seating uppermost.

Below each jig there are two stout vertical pins, as at E, each with an annular groove near its lower end. At the stations employed for tapping, these pins engage T-slots in blocks mounted between the rails of the track, one of these blocks being indicated at F. The pins and blocks prevent the jigs from lifting as the taps are withdrawn, and one of the shorter pins fitted to the trailing jig is seen at G in Fig. 9 and 10.

OPERATION SEQUENCE

As previously mentioned, a meter body is first loaded into the trailing jig of the pair. Loading is carried out between the single-spindle Herbert machine and the second twin-spindle Archdale machine on the left-hand side of the installation, as viewed in Fig. 8. At this position, a workpiece on which the operations on the first Archdale and the Herbert machine have been performed is transferred from the trailing to the leading jig, which is empty at this stage, and is replaced by a fresh casting. The fresh and partly-finished components then move round the circuit together.

At the first station of the circuit (at the left-hand spindle of the first Archdale machine, seen at the extreme left in Fig. 8), holes are drilled in the flange of each cylinder, and are subsequently tapped for the cylinder head fixing screws. There is a 6-spindle drill head at this station, and each spindle is fitted with a combination drill and countersink. Each drill produces a hole of 0.257 in. diameter and the depth of the countersink is equal to one thread pitch. A spindle speed of 1,000 r.p.m. is employed, and at this, and all other stations, the machine spindle is fed downwards by hand. Each cylinder flange is drilled in turn, the meter body being indexed in the jig between successive operations.

The holes are tapped with a $\frac{1}{8}$ -in. Whitworth thread at the second station (right-hand spindle of the first Archdale machine). Fast-spiral taps supplied by the English Steel Tool Corporation, Ltd., are employed, and are run at 153 r.p.m.

Drilling and tapping of the hole X, Fig. 1, are performed next, and the workpiece is indexed to the required setting with the aid of the auxiliary plunger on the fixture. The Herbert single-spindle machine employed for this stage is fitted with a combination drill and tap made by Vickers Arm-

strongs (Engineers), Ltd., and this tool is seen in the close-up view, Fig. 11. A hole is cored in the required position in the casting, and the combination tool incorporates a core-drill portion *J*, with two straight flutes, to open out the hole in the casting to the required size for tapping, and a tap portion *H*, with four flutes, to produce a $\frac{1}{2}$ -in. B.S.P. taper thread. The tool is made from solid high-speed steel, and more than 2,000 components have been drilled and tapped without regrinding the cutting edges. Special gears, made by the company, have been fitted to the Herbert machine, and give a spindle speed of 890 r.p.m. for drilling, and of 180 r.p.m. for tapping, speed changing being performed by the operator.

After the meter body has been transferred to the leading jig, and a fresh component has been loaded into the trailing jig, the leading jig is advanced to station 4, beneath the left-hand spindle of the second Archdale machine. Here, four holes, of 0.153 in. diameter, are drilled and countersunk in the boss surrounding the hole *D*, Fig. 1, at a spindle speed of 100 r.p.m., with combination tools.

These holes, which are subsequently tapped for the screws that secure the ball-bearing retaining plate, are countersunk to a depth equal to one thread pitch. Tapping of the $\frac{1}{2}$ -in. Whitworth thread in each hole is carried out at the second station of the Archdale machine, and, again, fast-spiral taps supplied by English Steel Tool Corporation, Ltd., are employed.

The jigs are now moved round the end of the track, and the meter body in the leading jig is inverted before it is located beneath the left-hand spindle of the first Archdale machine of the second group. A jig and workpiece



Fig. 11. Close-up view of the combination core-drill and tap made by Vickers Armstrongs (Engineers), Ltd., for machining an angular hole between two cylinders of the meter body. 2,000 components have been handled without regrinding



Fig. 12. Close-up view of the head for drilling 12 holes in the carbon deck face and surrounding flange. Soluble oil coolant, with Wynn's Friction Proofing added, is applied to the work from a ring-type manifold

are seen at this station (No. 6) in Fig. 12, and the machine quill is fitted with a 12-spindle head for drilling and countersinking holes in the carbon deck face and surrounding flange. The eight holes in the flange are drilled 0.257 in. diameter, and the four holes in the carbon deck face, 0.161 in. diameter. Combination drill and countersink tools are again employed, and are run at 955 r.p.m. Coolant is supplied to the tools by way of the ring-type manifold pipe *K*, which is mounted on the guide pillars of the multi-spindle head. In this instance, it may be noted, there is no guide-bush plate. The coolant employed at this and all other stations is a water-base soluble oil emulsion, to which Wynn's Friction Proofing (Metal Protection Products, Ltd.) has been added in accordance with the supplier's recommendations.

Tapping of the eight larger holes, to $\frac{1}{8}$ -in. Whitworth by $\frac{1}{2}$ in. deep, is performed at the adjoining station, at a spindle speed of 96 r.p.m. The four smaller holes are tapped No. 10-32 t.p.i., U.N.F. form, by $\frac{1}{2}$ in. deep, at the next station—the first on the second Archdale twin-spindle machine, at this side of the line. For both these operation stages E.S.T.C. fast spiral taps are used.

Finally, at the second spindle of the second Archdale machine, the hole *L*, Fig. 1, is drilled and

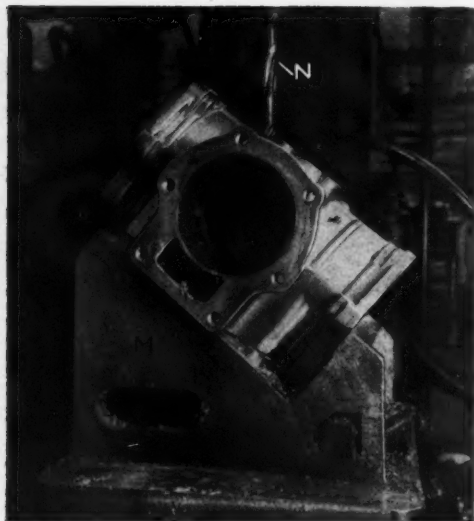


Fig. 13. This simple fixture is used for operations on an angular hole adjacent to the bearing boss at one side of the meter body, for which a combination drill and tap with spiral flutes is employed

tapped. The set-up for this tapping operation is seen in Fig. 13, the meter body having been removed from the leading jig of the pair on the track, and transferred to a simple fixture *M*. Of angle-plate type, this fixture is mounted on an auxiliary table fitted to the Archdale machine above the main table which supports the transfer track. The workpiece is loaded with the carbon deck flange in contact with a steel seating plate on the fixture body, and one cylinder head flange in contact with an abutment face at 90 deg. to the seating plate. It is then thrust transversely until the cylinder head face at the rear contacts a peg that projects from the seating plate.

A high-speed steel combination tool is used for drilling and tapping, as seen at *N*. This tool was made by Vickers Armstrongs (Engineers), Ltd., and produces a $\frac{1}{8}$ -in. B.S.P. taper thread. It incorporates a 4-flute tap portion and a 2-flute drill portion, and the flutes are of spiral form, since it has been found that straight flutes give rise to distortion of the hole, due to the angle at which it breaks through into the interior of the component. Drilling and tapping are performed at the same speed, namely, 314 r.p.m.

After drilling and tapping have been carried out, the finished meter body is placed on a wheeled stillage, and the two jigs are transferred to the

other side of the loop line where the first series of operations is performed on the workpiece in the trailing jig. The total time required for the drilling and tapping operations described is 9½ min.

When the stillage is fully loaded with finish-machined meter bodies, it is transferred to a cleaning station, where the bodies are washed out with hot soda solution. Blow-off plugs are then fitted, and each body is subjected to a water test, after which it is dried and passed to the assembly section.

Machining of other components for petrol pumps, and assembly operations, at the Crayford works of Vickers Armstrongs (Engineers), Ltd., will be described in subsequent articles to be published shortly in *MACHINERY*.

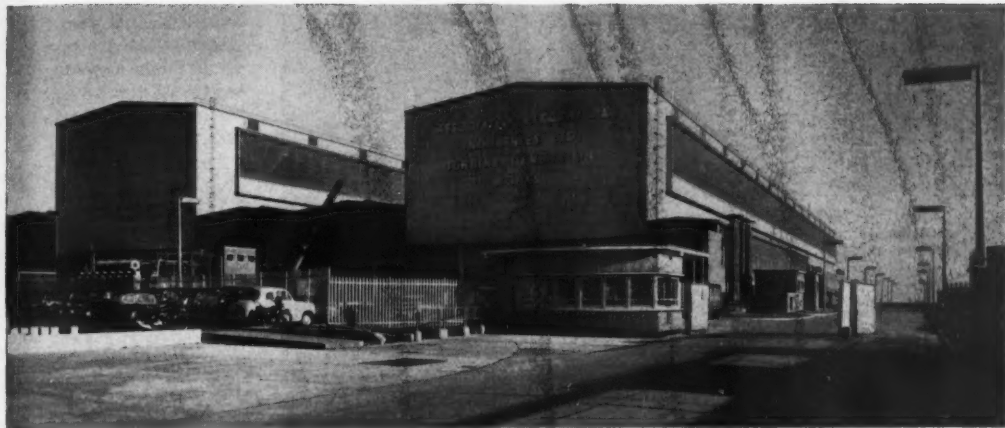
Deposition of High-purity Tungsten

Developments in guided missiles and space travel call for materials that can withstand high temperatures and maintain some measure of structural strength. Among the small number of suitable materials, tungsten is outstanding, since it has the highest melting point of all metals, namely 3,400 deg. C.

Until recently, however, the valuable high-temperature properties of tungsten could not be effectively utilized, since the brittleness and hardness of the metal prevented it from being machined by conventional methods and the relatively high weight restricted its use, in the solid form, in aircraft equipment.

For these reasons, efforts were made at the U.S. National Bureau of Standards to develop a practical method for depositing tungsten coatings. As a result of this work, high-purity tungsten can now readily be plated on metal surfaces by using a vapour deposition process developed independently by the Bureau, and by the U.S. Bureau of Mines. The method involves reducing gaseous tungsten hexafluoride with hydrogen by passing it over the heated object to be plated. At temperatures above 300 deg. C., tungsten is deposited on the hot surface, and the only other reaction product, namely, hydrogen fluoride, passes out with the excess hydrogen.

With this method, pure tungsten coatings in thicknesses up to $\frac{1}{8}$ in., can be deposited in a fairly smooth condition. It is possible to coat a variety of metals, also ceramic surfaces of such parts as rocket and missile nozzles, and jet engine components. Since a thick coating can be formed, this technique also lends itself to the fabrication of tungsten components.



The A.E.I. Turbine-generator Works at Larne

Some Aspects of the Factory and of the Machine Tools and Equipment

By A. W. ASTROP, Associate Editor

FOUR MAJOR PLANTS of Associated Electrical Industries, Ltd., are devoted to the production of turbines, generators, and associated equipment, and in floor space, the factory at Larne, Northern Ireland, is second only to that at Trafford Park, Manchester. The four factories present a total floor area of 1,423,000 sq. ft., of which 533,000 sq. ft. are at Trafford Park and 470,000 sq. ft. at Larne. At Rugby, the area is 260,000 sq. ft., and at the fourth plant at Petershill, near Glasgow, which is mainly devoted to heat-exchanger equipment, 160,000 sq. ft.

The Larne works is the most modern in the group of four, having been brought into operation as late as 1957, and it occupies an imposing site on the cliff-top, overlooking the Irish channel. There are two main covered areas at the Larne works, namely the heavy-machining and erection shop and a slightly smaller building devoted to the quantity-production of turbine blades in a wide range of sizes and designs. Details of some of the methods employed for making blades will be given in further articles to be published shortly. Here, the heavy machining area of the main building is considered, and a general view of a portion of the

exterior of this section is given in the heading illustration.

There are seven bays, each measuring 900 ft. long, with widths ranging from 25 to 100 ft., and two of these bays are considerably higher than the remainder, as can clearly be seen. One of the high bays has a clearance of 89 ft. below the roof trusses, and is equipped with travelling cranes at two levels. The lower crane has rails at 48 ft. above floor level, and the higher, at 69 ft., and loads up to 200 tons can be lifted in this area. The other "high" bay, at the right in the heading illustration, has a clearance of 74 ft. below the trusses, and the crane rails are at 43 and 63 ft. above ground level. Loads up to 75 tons can be lifted in this area. There is an eighth bay, at the far end of the factory as shown, which extends at right angles to those just mentioned, and is 50 ft. wide. Excluding the high bays, the clearances between the roof trusses and the floor are typically 40 ft., 30 ft. and 29 ft., and cranes with lifting capacities of 75, 50, 30 and 10 tons are provided. With the exception of the high-level crane in the highest bay, all other cranes in the main building can be "doubled" in order to increase the lifting capacity.



Fig. 1. General view of one of the "high" bays in the heavy-machining section of the A.E.I. turbine-generator works at Larne, Northern Ireland

Favourably placed in relation to the port facilities at Larne and Belfast, where additional quays have recently been built, the works are connected with these centres by new and improved roads. By means of the Larne-Preston ferry service, loads up to 45 tons can be transported on road vehicles to any destination within Great Britain, without intermediate off-loading. Loads in excess of 45 tons, up to a maximum of 200 tons, are despatched by sea, from Belfast.

A general view inside one of the high bays, showing a part of the heavy-machining section, is given in Fig. 1, which affords an indication of the internal design of the works and of the clean lines and freedom from obstructions which facilitate manoeuvring large castings and sub-assemblies. The roof is of aluminium, covered with 3-layer felt and $\frac{1}{2}$ -in. limestone chippings, and is glazed with $\frac{1}{8}$ -in. Georgian wired glass.

At the left in Fig. 1 can be seen part of a Kendall & Gent 300-ton plano-milling machine, which is equipped with two vertically-mounted milling heads and has provision for one side head. The table on this machine has a stroke of 32 ft., and it will admit workpieces up to 12 ft. wide by 8 ft. 6 in. high. In Fig. 2 is shown a close-up view of a

typical operation on this machine, namely, the milling of the joint surfaces on a half-casing for a turbine. The spindle quill is of 15 in. diameter, and the cutter here seen measures 17 in. diameter. This machine was described in detail in *MACHINERY*, 93/315—6/8/58, and another article (in *MACHINERY*, 90/991—3/5/57) was concerned with two 6-ft. square Kendall & Gent plano-milling machines which are also installed at the Larne works.

A feature of the largest Kendall & Gent machine is the provision of horizontal slideways on the back

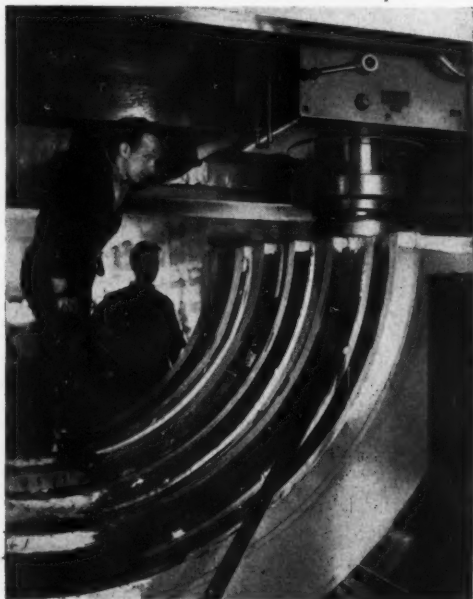
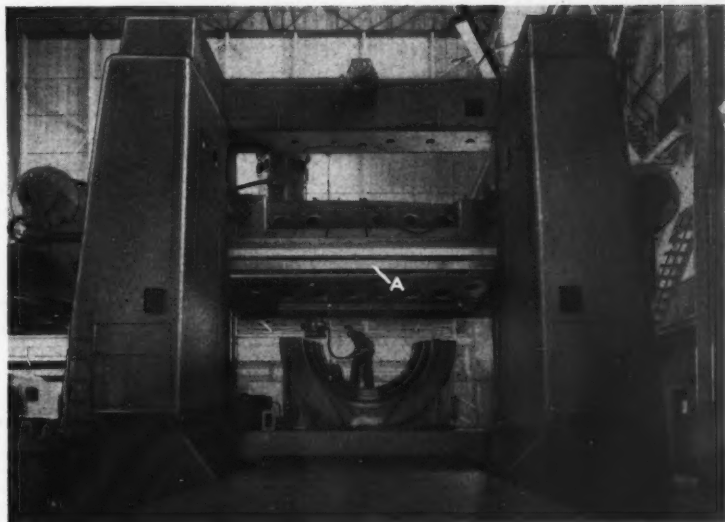


Fig. 2. Set-up on a 300-ton Kendall & Gent plano-milling machine for operations on the joint faces of a turbine half-casing

Fig. 3. Rear view of the large Kendall & Gent machine showing the slideways on the back of the cross-rail whereon a heavy-duty drilling head can be mounted



face of the cross-rail, as can be seen at A in Fig. 3, which is a view from the rear. The massive proportions of the machine are clearly apparent in this figure, and it may be noted that the operator is making use of a portable-type push-button box to control the various machine movements. On the slideways indicated at A can be mounted an Asquith OD 5 drill head, of the type used on one of that company's standard radial drilling machines, and a rack is provided on the back of the cross-rail whereby the head can be adjusted transversely to the required position. With this arrangement, drilling operations on the joint face of a turbine half-casing can be carried out at the same set-up as for milling, and considerable

reductions in handling time are thereby achieved.

At the right-hand side of the gangway in Fig. 1, in the middle-distance, can be seen one of a pair of Craven heavy-duty turning and boring mills, which have 16 and 18 ft. diameter work-tables. The smaller machine will admit workpieces up to a maximum height of 10 ft. 8 in., under the cross-rail, and the work-table is driven by an 80-h.p. motor. This machine weighs 126 tons, whereas

the 18-ft. machine weighs 135 tons, and will admit workpieces up to a maximum height of 12 ft. 9 in. Also visible in Fig. 1 is a Butler No. 8 spiral-electric planing machine, which has a 24 ft. long work-table and will admit workpieces measuring 8 ft. wide by 7 ft. high between the columns and under the cross-rail.

Other large machines in this high bay include: 10-ft. and 11-ft. radial drilling machines, a 10-in. horizontal, travelling-column, boring and milling

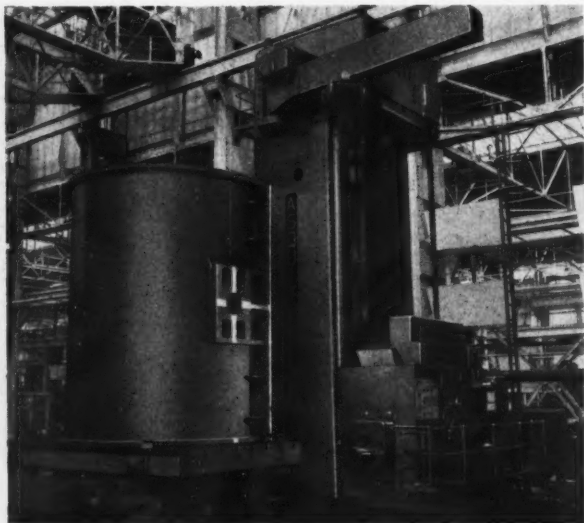


Fig. 4. Typical set-up on one of the two Asquith ram-type travelling-column boring and milling machines. With the aid of several attachments, multiple operations are performed on the stator casing here shown

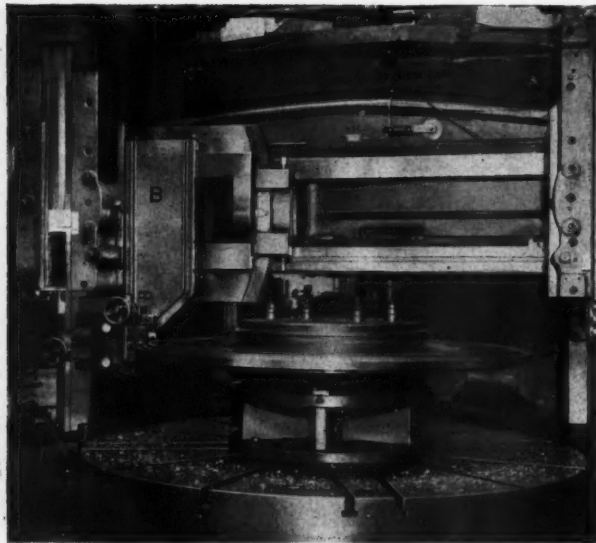


Fig. 5. Turning blade root grooves in a 6-ft. diameter turbine bucket wheel on a Richards vertical turning and boring mill which is one of two for operations on bucket wheels

machine, with horizontal and vertical traverses of 20 ft. and 15 ft., a horizontal drilling, boring and milling machine, with horizontal and vertical traverses of 24 ft. and 10 ft. (all by William Asquith, Ltd.) and a 27½-in., type CRS sliding, surfacing and screw-cutting lathe by Craven Bros. This machine will swing 54 in. diameter over the bed (42 in. diameter over the saddle) and will accept workpieces up to 23 ft. long between centres. For in-line boring operations—on turbine casings, for example—there is a large Noble & Lund traversing head-stock machine.

One of the most impressive machines in the other high bay is the Asquith 10-in. spindle ram-type horizontal boring and milling

machine shown in Fig. 4. This machine, which was described at some length in *MACHINERY*, 91/1397—13/12/57, is here seen set up for face-milling operations on a fabricated steel stator housing, and the 28-in. wide by 36-in. deep rectangular-section ram that houses the spindle is clearly shown. The spindle head has a vertical movement of 15 ft. on the column, and the latter has a horizontal movement of 33 ft. on a bed member which is sunk in the floor. Of the indexing type, the work-table is arranged for movement towards and away from the column on a sub-bed, which is arranged at right-angles to the main bed.

The multiple operations carried out on the stator housing at this set-up—some with the aid of various attachments—include: milling the feet; milling various pads on the sides; boring the hole in the pad on the side nearer the camera; and milling the cooler pockets. Among the attachments available for use with this Asquith machine may be noted: a universal milling head, which has two 360-deg. swivelling movements about axes that are mutually inclined at 45 deg.; a right-angle milling head; and two surfacing slides, with capacities of 2 and 4 ft. diameter.

In another bay, there is a pair of Richards

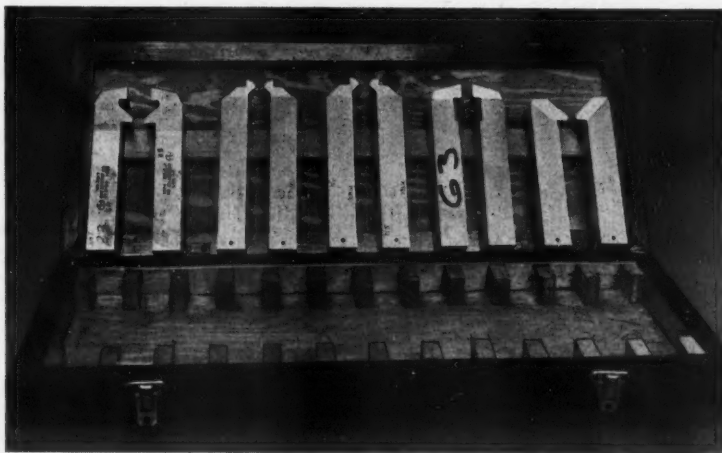


Fig. 6. Five of the six pairs of tools provided for turning blade root grooves in turbine bucket wheels

vertical turning and boring mills which are employed for operations on bucket wheels for rotor shafts, among other workpieces. A typical set-up on one of these machines, for turning a number of concentric grooves near the periphery of the wheel, is shown in Fig. 5. When these grooves have been machined in both faces a modified form of fir-tree section is obtained. Each blade for this wheel has a forked end, with tongues on the inner faces of the fork which mate with the grooves in the wheel. At one point, the grooves are subsequently milled away on both sides of the wheel, to provide a loading position, and the blades are introduced at this point and are slid around the periphery in the grooves. This process is continued until the wheel is close-packed with blades, and the final blade is then locked in position to secure the assembly.

It will be appreciated that the grooves in the wheel must be machined to within close limits for diameter, spacing, and form, and the various operations are carried out with the aid of special tooling. The tooling set-up was designed not only

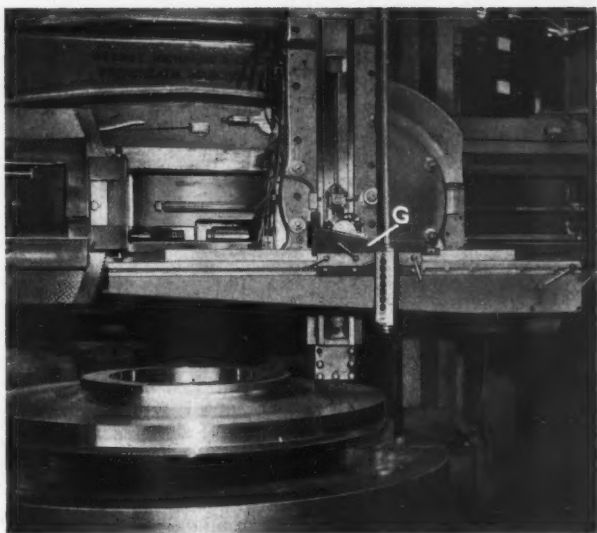


Fig. 8. On another Richards machine, turbine bucket wheels are copy-turned on both faces

to produce wheels to the specified accuracy, but also to be used by semi-skilled labour, and has proved completely satisfactory. There are six pairs of special form tools in a complete set, and five pairs can be seen in Fig. 6, in the wooden box in which they are stored. The remaining pair of tools is seen in use in the close-up view Fig. 7, which also shows the lower end of the special tool-slide indicated at B in Fig. 5. This slide can be adjusted on the cross-rail of the machine, and carries at the lower end a special twin tool-holder, which is arranged for horizontal adjustment by means of the handwheel at the extreme left.

At the start of the operation, this tool-holder is set horizontally to a slip gauge, which is introduced between a ground face at the leading end and the periphery of the workpiece. Each of the tools is ground to a known length, from a datum face on the formed portion to the flat face at the opposite end of the shank, and is located in the holder by the latter face. For setting in the vertical plane, the tool-holder is raised and lowered by means of the handwheel C, which

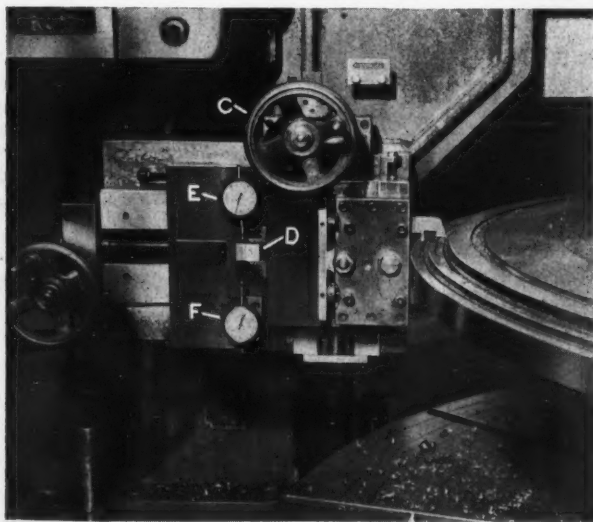


Fig. 7. Close-up view of the special tool-slide which has been provided on the Richards machine shown in Fig. 5

turns a screw. At the rear of the tool-holder, there is a ground block *D*, and for machining the grooves in the under-side of the wheel (as in Fig. 7) the tool-holder is raised until the block *D* abuts the plunger of the dial indicator *E*.

Movement is continued until a predetermined reading is obtained on the dial *E*, which indicates that the tool in use has been fed to the required depth. For machining the grooves in the upper face of the wheel, the process is reversed, and the tool-holder is lowered until a predetermined reading is obtained on the indicator *F*. It will be appreciated that different readings are required on the two dials for the various pairs of tools, and the operator is supplied with a simple drawing and chart combined, giving scrap sections of each operation in the sequence. These small drawings are arranged in the order of operation, and the appropriate indicator readings and tool numbers—and any other relevant information—are appended. The wheel which is being machined in Fig. 5 is 6 ft. 1½ in. diameter by 11½ in. deep at the boss portion.

A neighbouring Richards machine, of the same type and capacity, is provided with electric copying equipment, and is employed for turning the faces of bucket wheels to the required form. A typical

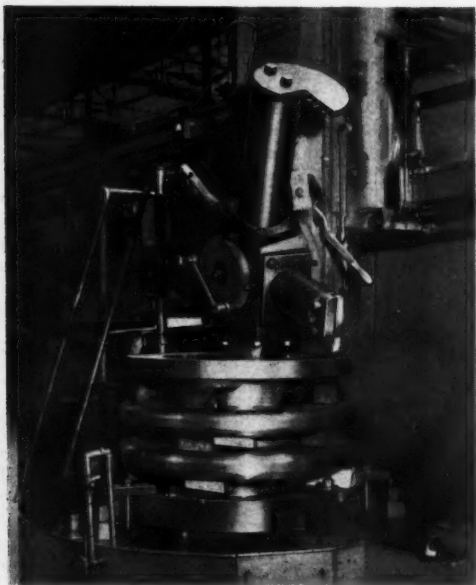


Fig. 9. The convolutions on this coupling for a low-pressure turbine are copy-turned, internally and externally, on this 48-in. Webster & Bennett vertical turning and boring mill

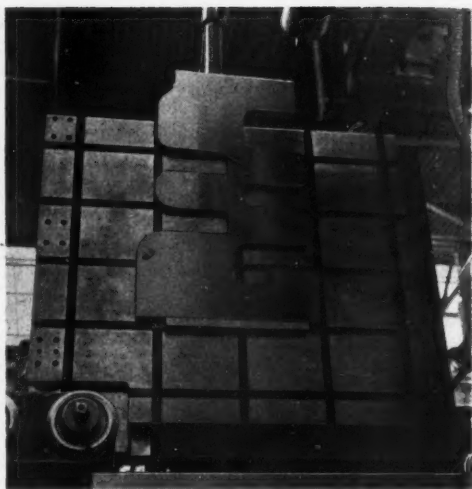


Fig. 10. Close-up view of the template employed for copy-turning the coupling seen in Fig. 9. The form at the right is for the external surface, and that at the left for the internal surface

set-up is shown in Fig. 8, where the master template is indicated at *G*. It is carried on a cast-iron cantilever arm, supported from a bracket on the right-hand upright, and is arranged for longitudinal adjustment, to facilitate setting-up for diameter. The bucket wheel here shown is also 6 ft. 1½ in. diameter, and the operations performed at this set-up comprise turning each face and the periphery of the central boss, and boring the centre hole to within ± 0.0005 in. The machine has provision for maintenance of constant cutting speed—in this instance 200 ft. per min.—over the full width of the cut. A feed rate of ⅜ in. per rev. is employed.

COPY-TURNING BELLOWS-TYPE COUPLINGS

Couplings for large turbine-generators afford another interesting example of copy-turning practice at the Larne works, and a typical set-up for one of these components is shown in Fig. 9. The machine is a 48-in. Webster & Bennett vertical turning and boring mill, of which a number is installed, and it is equipped for electrically-operated copying. Of 32½ in. outside diameter by 20 in. high, the coupling seen in position on the work-table is machined from a forged steel billet, which, when brought to the machine, has plain, parallel, internal and external surfaces. The bellows-type shape seen on the external surface is repeated in-

ternally, to provide a nominally constant wall thickness, and is produced under template control with the aid of a number of tools mounted in the turret.

A close-up view of the template is given in Fig. 10, where the form for the inside surface is seen at the left, and that for the outside surface at the right. An internal view of the coupling, showing some of the convolutions, is given in Fig. 11, where the turret has been raised to show the tool. This tool is slightly cranked, and is used for operations on the under-sides of the internal convolutions. There is a number of tools, of different shapes, which are used successively to machine various portions of the internal and external shapes. The coupling is first roughed-out completely, internally and externally, and is then stress-relieved prior to the finish-turning operations. After the operations have been com-

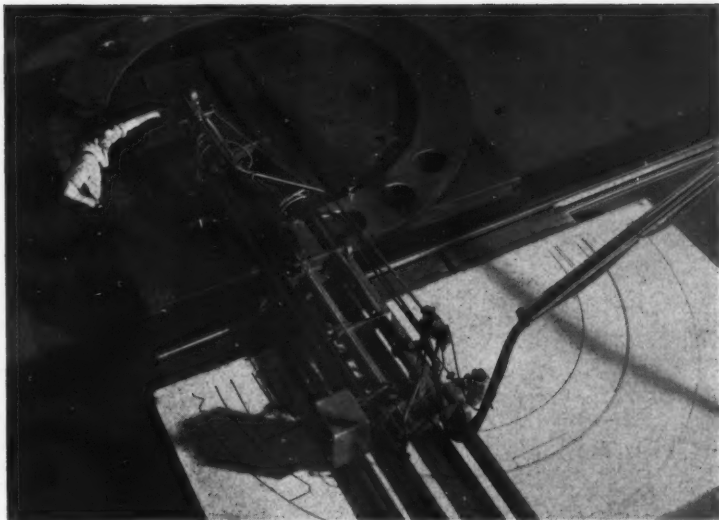


Fig. 12. Hancomatic flame-cutting machine set-up for operations on a stator ring. The machine automatically follows the drawing seen in the foreground

pleted, the plain portion at the lower end of the coupling, visible in Fig. 9, is gear-cut, to produce 57 teeth at 1.737 c.p. The wooden wedges seen driven between the external convolutions in Fig. 9 serve to damp-out vibrations during the operations on the internal surfaces.



Fig. 11. In this view, the convoluted bore of the coupling shown in Fig. 9 can be seen

FACILITIES FOR FABRICATING

Ample space is provided for fabricating, by welding, large components, such as the stator housing seen in Fig. 4, and a wide variety of flame-cutting, plate-bending and similar equipment is installed. Equipment provided for plate-cutting includes a Hancomatic type HM 2B profiling machine [Hancock & Co. (Engineers), Ltd., Progress Way, Croydon], which has a working area of 62 in. by 120 in., and will cut workpieces from $\frac{3}{8}$ to 15 in. thick. This machine operates under the control of a conventional drawing of the part required, and cutting is seen in progress on a typical workpiece—a large ring for a stator housing—in Fig. 12.

Mention may also be made of the facilities for annealing and shot-blasting. The annealing furnace is oil-fired, and will admit components up to 20 ft. square by 35 ft. long, with weights up to 70 tons. For shot-blasting, there is a room which will accommodate workpieces measuring 26 ft. 6 in. wide by 24 ft. high by 38 ft. 6 in. long, also with weights up to 70 tons.

NEW PRODUCTION EQUIPMENT

Edited by
G. W. Mason
and
A. J. Barker

Holbrook Type H No. 17 Precision Lathe

The type H No. 17 precision lathe introduced by the Holbrook Machine Tool Co., Ltd., Cambridge Road, Harlow, Essex, at the 1960 International Machine Tool Exhibition at Olympia, is now in full production. This lathe, which is shown in the accompanying figure, can be supplied with various alternative features to suit customers' requirements. It will swing 20 in. over the bed, and 11½ in. over the carriage, and is normally supplied to admit 42 in. between centres. If required, a longer bed, to accommodate 66 in. between centres can be provided.

Drive to the geared headstock is taken by V-belts from a motor of 10 h.p., and the 16 speeds range from 15 to 1,000 r.p.m. Alternative ranges from 10 to 666 r.p.m. and 22 to 1,500 r.p.m. can be provided if required. Spindle speeds are selected by a single lever, and starting, stopping and reversing can be controlled from both the gearbox and the apron. The spindle is mounted in two taper-roller bearings at the front, and two parallel roller bearings at the rear. It is bored 2½ in. diameter and has a D1. 8-in. Cam-Lock

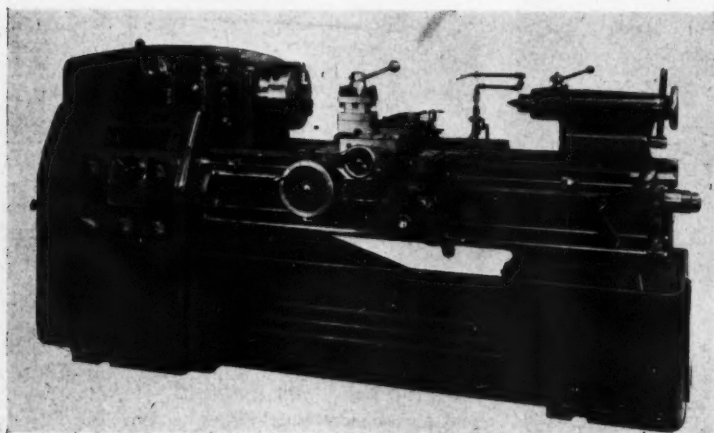
nose. All the gears in the headstock are of nickel-chrome steel, hardened and profile ground, and are pump lubricated.

The totally-enclosed, quick-change gearbox provides 60 threads and feed rates which are selected by a dial and associated levers. Threads obtainable range from 1¼ to 76 per in., and the sliding and surfacing feeds from 0.0013 to 0.080 in. per rev. If metric pitches are frequently required, a direct change-over unit can be built into the gearbox as additional equipment to obviate the need for separate change gears. A reverse clutch, controlled by a lever on the apron, is provided for the screwcutting and feed motions. The apron is of double-wall construction and incorporates a safety overload clutch in the feed drive. A power-operated quick-traverse motion can be provided, if desired, with an arrangement for disconnecting the saddle traverse handwheel. The leadscrew is used only for screwcutting, and is fitted with the firm's compensated thrust bearing in the end bracket.

The bed has precision ground double-vee and flat-guideways, and diagonal bracing which ensures rigidity and ample clearance for swarf. It is supported on a base which houses the electrical

equipment, also the coolant sump and pump.

All sliding surfaces of the carriage, except the top slide, can be lubricated at will by depressing a pump lever on the right side of the apron. A quick-withdrawal mechanism is incorporated to facilitate internal and external screwcutting operations, and automatic stops may be used for screwcutting, turning and boring. Multi-start threads are normally obtained by indexing the change gears, but an indexing plate can be supplied to give 60 positive settings.



Holbrook type H No. 17 precision centre lathe

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The heavy-duty tailstock can be set over for taper turning and the Morse taper centre is self-ejecting. For production work, a tailstock with a larger diameter barrel, with both fine and coarse feed motions, can be fitted.

Standard equipment for the lathe includes a square-turret top-slide, faceplate, 3-point steady, and a driving plate and driver. Other equipment that can be provided includes a taper turning attachment, a draw-in collet attachment, a sub-head spindle speed reducer for cutting coarse threads, a universal relieving attachment, a hob grinding attachment, and a spherical slide for concave and convex turning. Hydraulic copying equipment can be fitted, to enable internal, external and face profiling to be performed. For repetition work that requires the use of a number of tools, a top-slide unit, with quick clamping arrangements, can be fitted to take a range of precision, interchangeable, tool-holders.

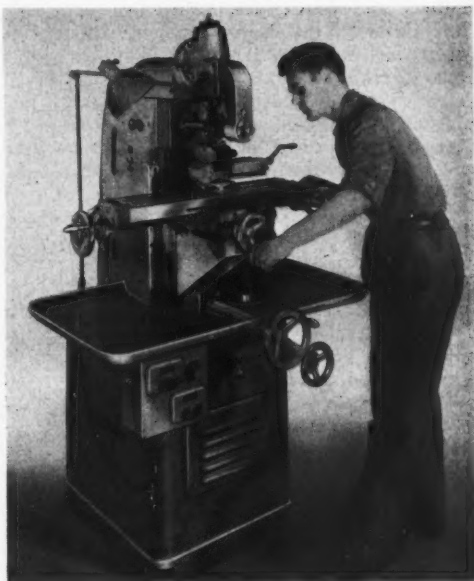
The accuracy of the leadscrew and associated gear train on each Holbrook lathe is checked against a master screw certified by the National Physical Laboratory to be accurate for pitch within 0.0002 in. over a length of 6 ft. This master screw is mounted between the centres of the lathe and the test is carried out with the aid of a Taylor-Hobson Talymin electric stylus head in conjunction with a chart recorder, according to a procedure originated by the N.P.L., and to which reference has previously been made in **MACHINERY**.

Schaffner W.12 Universal Milling Machine

Dowding & Doll, Ltd., 346 Kensington High Street, London, W.14, have recently been appointed sole agents in the United Kingdom for the range of milling machines built by E. Schaffner, A.G., Schonenward, Switzerland, and an example is shown in the illustration. Designated W.12, this universal machine incorporates a 30- by 8-in. work-table, which is provided with a longitudinal traverse of 17 in.

Steplessly-variable feeds from $\frac{1}{32}$ to 5% in. per min. are obtainable for this motion. Lateral and vertical hand adjustments of 5% and 10% in., respectively, are provided, and stops to limit travel in these directions can be set accurately with the aid of graduated scales. The slides are mounted on hand-scraped ways, and movements are applied by means of hardened and ground screws.

Maximum and minimum distances of 13% and 3% in. are obtainable between the surface of the work-table and the axis of the horizontal milling spindle, also between the table and the spindle nose of the vertical head. The latter unit can be swivelled through 360 deg. about a horizontal axis,



Schaffner W.12 universal milling machine

and is carried by a ram which is mounted in dovetail ways at the top of the column. With this arrangement, throat depths from $3\frac{1}{2}$ to 9 in. can be obtained for vertical milling, and the head can be retracted clear of the working area, to permit bulky components to be accommodated when using the horizontal spindle. The short, stiff overarm bracket is bolted to the outer face of the vertical head, and may be readily removed. Drive for the spindles is taken through hardened, ground and lapped gears, and the steplessly-variable speeds obtainable range from 45 to 2,640 r.p.m.

Equipment can be supplied for slotting and spiral milling, and a universal dividing head and an indexing work-table are also available.

Monarch Mona-Matic No. 21 Copying Lathe

Built by the Monarch Machine Tool Co., Sidney, Ohio, U.S.A., who are represented in this country by Rockwell Machine Tool Co., Ltd., Welsh Harp, Edgware Road, London, N.W.2, the Mona-Matic No. 21 copying lathe seen in the figure is intended primarily for turning stepped shafts. Surface finishes of approximately 40 micro-inches can be obtained, and it is stated that diameters can be held to within 0.0002 to 0.0004 in., depending on the workpiece length.

Movement is applied hydraulically to the copying slide under the control of an Air-Gage tracer head, which may be adjusted laterally. For controlling workpiece size, a $\frac{1}{4}$ - to 5-in. capacity caliper gauge is brought automatically to the measuring position to check one diameter, with a frequency which may be pre-set at 1, 5, 10, or 20 operating cycles. Any error which is detected causes a signal to be transmitted to an electro-mechanical servo system, whereby a correcting movement is applied to the tracer head, and in this way, compensation is made automatically for tool wear. To prevent the continued use of a tool after the estimated permissible amount of wear has taken place, a counter is provided which may be set so that a signal lamp is illuminated after the completion of any predetermined number of operating cycles, up to 400. The operator then brings a fresh tool or cutting edge to the working position, and presses a button to retract the tracer head. Before re-starting production, a short trial cut is taken, and the turned surface is gauged, to enable the servo system to adjust the tracer head. Interlocking is provided, to prevent a fresh cycle from being started if the re-setting signal is ignored.

Drive is taken from a variable-speed d.c. motor of 20 h.p., with a 4:1 range, which is mounted, together with the electronic control equipment, in a separate power unit. This unit also provides for the supply of pressure oil to the hydraulic system, and incorporates coolant equipment. The drive is transmitted through a Poly-V belt and a flexible rubber coupling, and spindle speeds from 800 to 3,200 r.p.m. are obtainable. The steplessly-variable feeds available range from $2\frac{1}{2}$ to 20 in. per

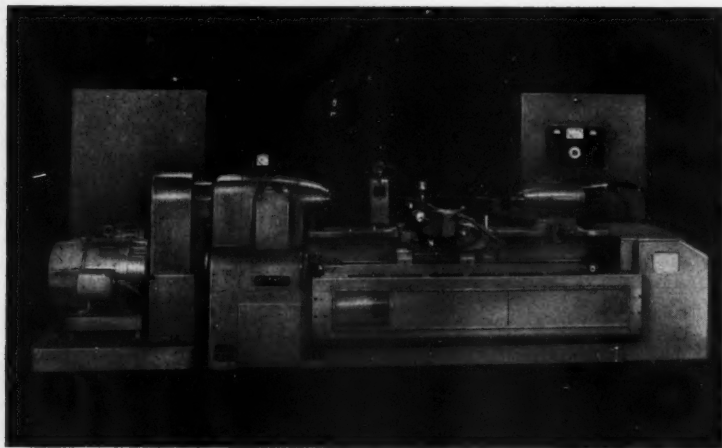
min., and up to six different feeds and speeds can be pre-selected for automatic engagement, as required, during an operating cycle.

Lamberton Horizontal Forging Machine

Recently installed in the Mossend, Lanarkshire, tube works of Stewarts and Lloyds, Ltd., the horizontal forging machine here shown was built by Lamberton & Co., Ltd., Coatbridge, Lanarkshire, and provides for upsetting the ends of heavy steel tubes up to 10 in. diameter, as required for lining deep oil wells. During subsequent operations, male and female threads are cut at opposite ends of each tube, to permit lengths to be connected together without the need for coupling pieces. The machine is capable of exerting a force exceeding 2,000 tons, and has a total weight of approximately 300 tons.

Forging is performed in successive stages by a series of punches carried on the main slide, which is driven directly from a crankshaft. For the operation, a workpiece is transferred from a heating unit, in which a portion at one end is raised to the forging temperature, to rollers on a manipulator. Part of this manipulator can be seen at the left in the figure, and it enables the work to be elevated to the level of the first tool station, and then advanced into the working position. During the operating cycle, dies carried on a side slide, which is driven through toggle links and cams from the crankshaft, are closed to grip the work in preparation for the forging blow. After the completion of this stage, the work is lowered by means of the manipulator to the next tool station, where it is again advanced to the forging position, and this cycle is repeated until the entire sequence has been completed.

On account of its large size, the main frame of the machine is constructed in two pieces, one of which weighs more than 100 tons. The main and side slides are mounted in automatically-lubricated, anti-friction guides, and the former has a stroke length of 30 in. Drive to the crankshaft is taken from a 250-h.p. motor through V-belts and reduction gearing and a

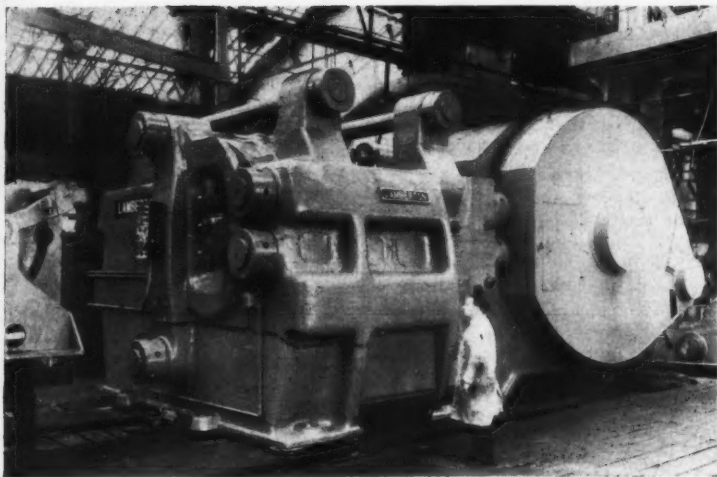


Monarch Mona-Matic No. 21 copying lathe

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Large Lamberton horizontal forging machine, for upsetting the ends of heavy steel tubes up to 10 in. diameter

single-operation multi-plate clutch. Both the clutch, and a disc brake which is also incorporated, were specially designed and made by the company, and are air-operated. They are arranged so that, in the event of failure of the air or electrical supplies, the clutch is automatically disengaged and the brake applied. Provision is also made for safeguarding the machine against overloading and misuse.

The sale of machinery built by Lamberton & Co., Ltd., is handled by the subsidiary, Eumuco (England), Ltd., 26 Fitzroy Square, London, W.1.

Iariston Tube Tapering Machine

The Addison Tool Co., Ltd., 28 Marshalsea Road, London, S.E.1, are the agents in this country for the Italian-built Iariston tube tapering machine shown in the accompanying figure. On this machine, tubes up to 2 in. diameter can be tapered by swaging, and additional equipment available includes special dies for doming the ends of tubes, and an attachment for forming tapers on bent tubes.

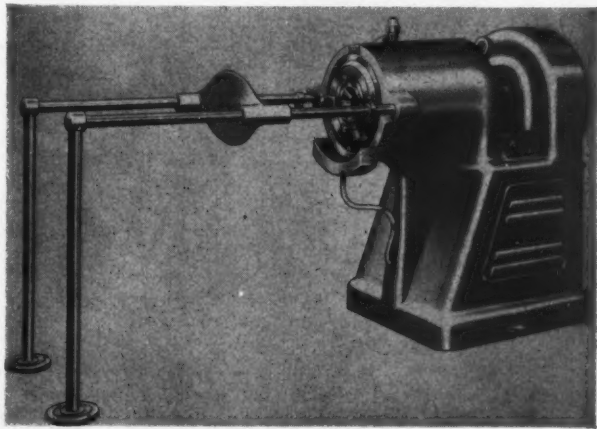
Die length may be 12, 16, 18, or 22 in., and it is claimed that the machine is particularly suitable for

the production of components for metal furniture, bicycles, and motor cycles; for example. The tube to be tapered is introduced into the die either by hand or with the aid of a pushing device. Length of taper is controlled by adjustable stops, and sufficient clearance is provided to enable tapers in excess of the die length to be formed. Quick-action clamps and a special extraction device enable the dies to be rapidly changed.

The machine frame is a one-piece casting, and the spindle, which is of high-tensile steel, heat-treated and ground, is mounted in taper roller

bearings. Drive is taken from an 8-h.p. motor, through six V-belts, and the flywheel runs at 330 r.p.m. Lubrication is provided by a motor-driven pump which draws oil from a sump in the base.

As an indication of the production capabilities of the machine, it is stated that a 2-in. diameter tube can be tapered to a point, over a 12-in. length, in 35 sec., and a 1-in. diameter by 16-gauge tube tapered over a 15-in. length in 6 sec., floor-to-floor time.

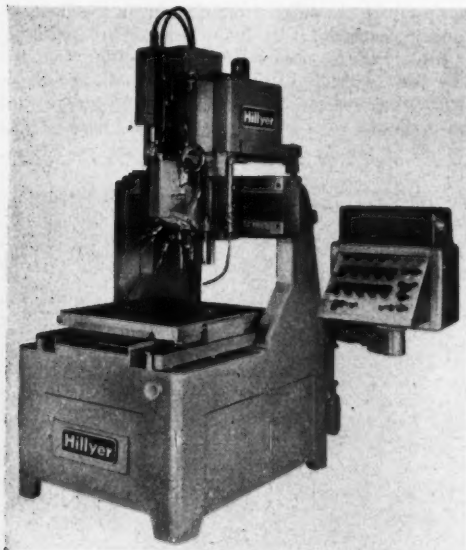


Iariston type 50 tube tapering machine

Hillyer Tape-controlled, Co-ordinate Drilling Machines

Shown in the accompanying illustration is an example from a range of tape-controlled, co-ordinate drilling machines, which has been introduced recently by the Hillyer Corp., Cranford, N.J., U.S.A. Boring, reaming, tapping, and straight-line milling can also be carried out, and it is stated that the accuracy with which the drilling unit is positioned laterally, and the table longitudinally, is such that hole centre distances can be held within 0.001 in. per ft.

Carried on an arm attached to the side of the machine, the control unit incorporates a tape reader. In addition there are dials whereby co-ordinate positions, and the spindle speed, feed rate and depth of feed for each station of the multi-spindle drilling head, can be set up by hand. When the machine is operated under automatic control, co-ordinate information is supplied by means of a punched tape, which also determines the drilling conditions for each station of the head. The tool at a given station can, moreover, be employed for producing holes of different depths at various stages during a cycle. Operating rates up to 15 holes per min. are claimed.

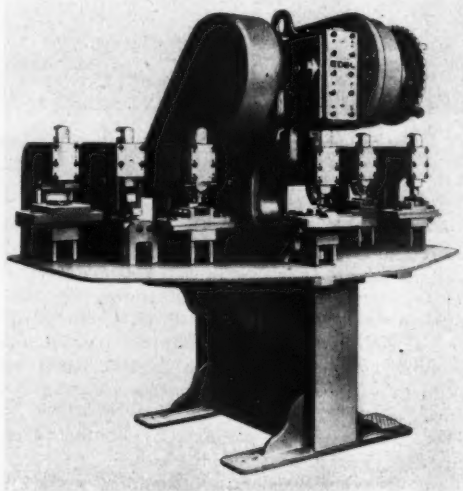


Co-ordinate setting of the drilling unit and the work-table, also selection of the speed, feed rate and depth for each spindle position on this Hillyer machine are controlled by punched tape

Either a 4-in. wide plastics or Flexowriter 1-in. paper tape can be used. Preparation is said to be simple, and with the former type, a hand-operated punch is employed to pierce the tape directly in a decimal form, no special training for the operator being required. A keyboard-type punch is used in the preparation of a Flexowriter tape.

Edel VM 35 Eccentric Presses, with Interchangeable Tool Units

Interchangeable, self-contained tool units, of the C-frame type, are employed with eccentric presses in the German-built Edel VM 35 range, which is



Interchangeable, C-frame tool units, examples of which are here seen, are used on this eccentric press from the Edel VM 35 range

marketed in this country by F. J. Edwards, Ltd., 359-361 Euston Road, London, N.W.1. A unit is retained in the working position by means of a lever-operated clamp, and with this arrangement, tool changing is effected rapidly, and the idle time when dealing with small batches, for example, is kept to the minimum.

Units are available for piercing operations, and others can be supplied which incorporate punches and dies for shearing material of circular, rectangular, and other cross-sectional shapes, also for square and mitre notching. Cropping tools can be supplied, and special punches and dies can be provided, if required.

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Rece Ltd., portabl weighs 7½ by section overall examp in. dia The pairs consta tension Drive

The range of presses comprises five sizes, with capacities from 35 to 100 tons, and throat depths from 7% to 13% in. The frame is of fabricated construction, and the hardened and ground ram is guided by long, adjustable ways. Drive from the eccentric shaft, which runs in hard bronze bearings, is taken from a motor to a balanced flywheel, and thence through roller bearing-mounted shafts and totally-enclosed reduction gearing. A hardened and ground multi-tooth dog clutch is incorporated in the transmission system, and can be operated by a lever or a pedal. The range of extra equipment which is available includes feed units and precision length stops.

"Baby" Portable Bandsawing Machine

Recently introduced by Soag Machine Tools, Ltd., Juxon Street, London, S.E.11, the "Baby" portable bandsawing machine, here shown in use, weighs 21 lb. and has overall dimensions of 21½ by 7½ by 6½ in. It has capacity for cutting circular-section bar up to 2½ in. diameter and sections with overall dimensions up to 4½ by 3 in., and as an example of the operating speed, it is stated that 1½-in. diameter mild steel bar is cut in 80 sec.

The high-speed steel blade is guided by two pairs of hardened steel rollers, and is kept under constant tension by a rack and pinion system. This tension may be readily released, for blade-changing. Drive is taken from a ¼-h.p. motor through a



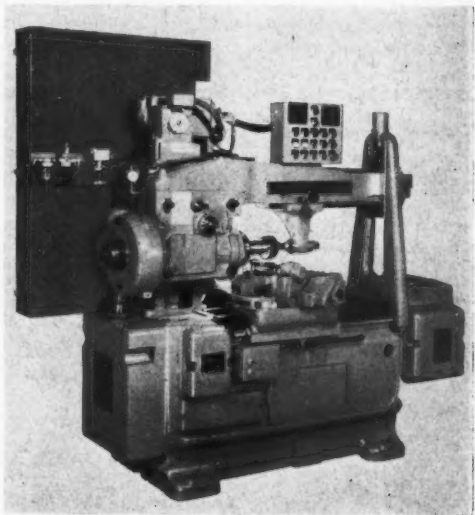
"Baby" portable bandsawing machine

train of six hardened helical gears, and the cutting speed is 115 ft. per min.

Extra equipment available includes a stand, which enables the machine to be used vertically, in conjunction with a work-table, or horizontally. A swivel-type vice is employed for holding the work, with the latter arrangement, and the machine is pivotally-mounted at the front, and requires no attention while cutting is in progress.

Barber-Colman Multicycle Automatic Hobbing Machines

The Barber-Colman Co., Rockford, Ill., U.S.A., who are represented in this country by Barber & Colman, Ltd., Marsland Road, Brooklands, Sale,



Power vertical movement is provided for the work slide of this Barber-Colman No. 16-16 Multicycle automatic hobbing machine

Cheshire, introduced, at the Chicago Machine Tool Exposition last year, alternative Multicycle versions of their 16- and 6-in. hobbing machines. In the accompanying illustration is shown a No. 16-16 machine of the modified design, on which power feed and traverse is available for vertical movement of the work slide as well as for traversing the hob slide. With this system worm gears can be produced.

Movement of the slides is controlled by means of cams, which can be readily adjusted when setting

up, and three different automatic operating sequences can be obtained. With the "square" cycle, the conventional hobbing sequence is followed, with rapid approach of the work slide before machining begins, and subsequent rapid return of the hob slide to the starting position. The "plunge" cycle provides for rapid approach of the work slide, followed by the application of feed to bring the hob to depth, various rates being obtainable. For the "plunge-approach" cycle, the motions of these sequences are combined and the hob is very rapidly brought to the full depth at the start of the operation. Selection of the required sequence is made in a simple manner.

A considerable reduction of non-productive time is claimed, and it is stated that when the "plunge-approach" cycle is employed it is often possible to use larger hobs, with multiple starts. With such hobs, accuracy may be improved and machining time reduced.

Masterlap Twist Drill Grinding Attachment

Lester-Brown Machine Tools, Ltd., Bayton Road, Exhall, Coventry, have recently introduced the twist drill grinding attachment, shown in the accompanying illustration, for use with the Lester-Brown Masterlap grinding and lapping machine which was described in MACHINERY, 92/1307—30/5/58.

The attachment can readily be substituted for a table and stop arm which are normally mounted

on the machine. A bracket, indicated at A, when fixed in position is inclined at an angle of approximately 25 deg. to the base of the machine, and the shaft B must be parallel with the grinding wheel spindle. For the latter setting, a special gauge is supplied with the attachment.

The twist drill to be sharpened is inserted in the attachment, located against a stop, and clamped between jaws. A scale, marked from 80 deg. to 160 deg., provides for setting the included angle of the drill point. Feed is imparted to the drill by a threaded sleeve at C, which has a circular scale marked in increments of 0.0025 in. The drill clamp is moved from the loading position to the grinding position by means of the ball-ended lever on the left of the attachment, and locked. Another lever, on the right, is employed to apply a rocking movement to the twist drill while grinding is in progress. The second lip is ground by unclamping the drill, turning it through 180 deg., reclamping it, and repeating the procedure.

This attachment may be employed for sharpening twist drills of $\frac{3}{8}$ to $\frac{1}{2}$ in. diameter, with overall lengths of 2½ to 9½ in., and is stated to ensure accurate grinding of cutting and clearance angles.

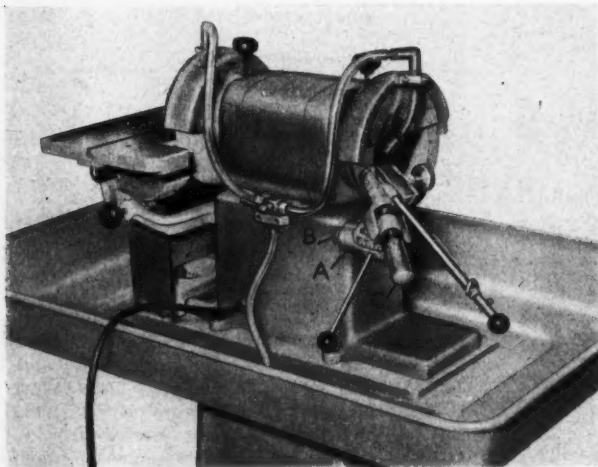
"Standard" Sliding-head Spot Welding Machines

The accompanying illustration shows an example from a range of sliding-head spot welding machines which has been introduced recently by

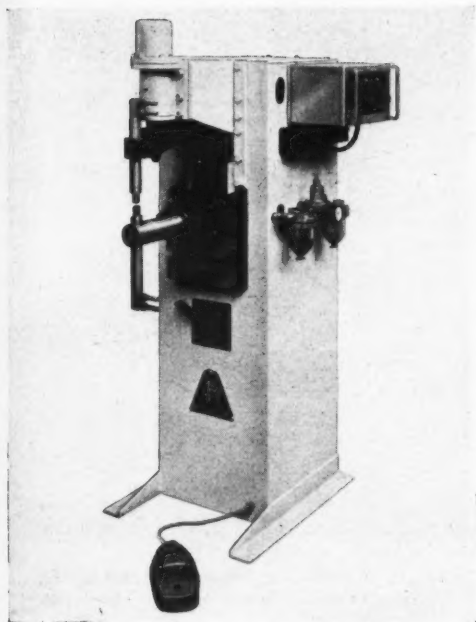
Standard Resistance Welders, Ltd., Endurance Works, Maypole Fields, Cradley, Staffs. Sizes are available with nominal ratings of 25, 35, and 50 kVA. for a 50 per cent duty cycle, and the machines, which are also suitable for projection and stitch welding, can be operated at rates up to 250 welds per min.

Provision is made for horizontal adjustment of the arms carrying the electrode holders, and the lower member is bored at both ends, to accommodate a holder either vertically or inclined at an angle of 20 deg. Vertical movement of the welding head is effected by an air system, which incorporates a pressure regulator and provides for exerting the maximum electrode tip force normally required with a compressed air supply at 80 lb. per sq. in.

The electrical equipment is arranged for connection to two phases of a 400/440-volt, 50-cycle, 3-phase



Twist drill grinding attachment for the Lester-Brown Masterlap grinding and lapping machine



"Standard" low-capacity sliding-head spot welding machine

supply, and the welding cycle is controlled by a 4-stage electronic timer, in conjunction with either an ignitron contactor or a contactor switch. Individual adjustment is provided for the durations of the various stages, and the ranges are from 3 to 20 and 15 to 100 cycles of the electrical supply for the "squeeze" and "weld" portions, and 3 to 50 cycles for the "forge" and "off" portions.

Provision is also included for either single or repetition operation. Welding current is supplied by a high-efficiency low-impedance transformer, and heat regulation is obtained by means of a 6-stage, off-load rotary switch.

Donovan CE 32 Proximity Switch

Now being made and marketed by Donovan Electrical Co., Ltd., Granville Street, Birmingham, 1, the CE 32 proximity switch has been used for some five years by Austin Motor Co., Ltd., for applications where a signal similar to that obtained from a limit switch is required, but where mechanical operation is not possible. It is of the inductive coupling type, and is thus un-

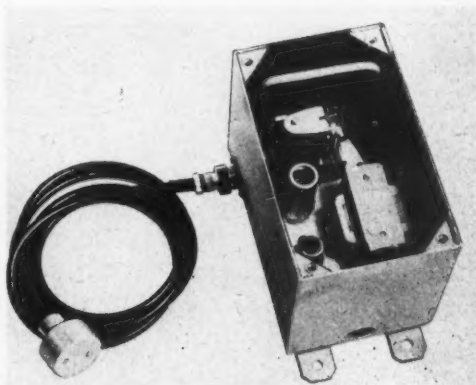
affected by stray electrical fields, a characteristic that has permitted its employment in the vicinity of r.f. induction heating equipment.

The plug-in control unit is housed in a steel case measuring 7½ by 4½ by 5½ in. high, with a detachable cover, and may be connected to an electrical supply at either 250 or 400 volts a.c., satisfactory operation being possible with voltage fluctuations up to 20 per cent. A relay with change-over contacts rated at 5 amp. at 250 volts is normally incorporated, which provides for a maximum of 5 switching operations per sec. If a higher switching frequency is required, this relay may be omitted and the unit employed for feeding static switching equipment.

Completely sealed in a 1½-in. diameter by 1½-in. long head, the sensing coil is connected to the control unit case by a 6-ft. long cable. It will detect any metallic object which is passed at right-angles or parallel to the axis of the head, provided that it has a surface at least the same size as the projected area of the coil, and approaches to within about ⅛ in. of this member. The latter limit corresponds to a distance of approximately ¼ in. from the end face of the head assembly.

Swarf and metallic dust are not detected, and as there are no magnetic components in the head, ferrous materials are not attracted. The head can be completely submerged in coolant, for example, and a special type is available for detecting broken cutting tools.

The illustration shows the control unit with the cover removed, and the standard sensing head.



The Donovan CE 32 proximity switch provides a signal similar to that from a limit switch but does not require mechanical actuation

Wild-Barfield 2-station Induction Heating Machine

FOR HARDENING AND TEMPERING starter ring gears for motor car engines, and assembling them to flywheels, Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, Otterspool Way, Watford By-Pass, Watford, Herts., have recently supplied to an Australian factory the 2-station semi-automatic induction heating machine shown in Fig. 1. With this machine, it is stated work of consistent quality is obtained with an unskilled operator, and the need for subsequent cleaning is avoided.

Hardening is carried out at the left-hand station, where there is a spider carrier, with downwardly-inclined arms, mounted at the upper end of a vertical shaft. In operation, a fresh ring gear is placed over these arms by hand, and is pressed downwards, to engage with spring-loaded clamps at the lower ends. The automatic working cycle is then started by means of a push-button, whereupon the carrier is lowered for a short distance, to transfer the work into the plane of the single-turn heating coil. By means of this coil, the

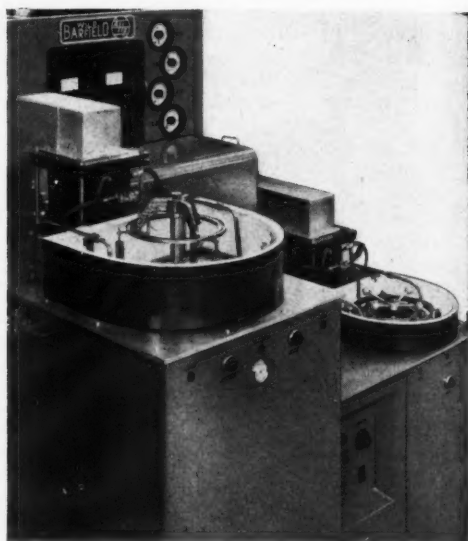
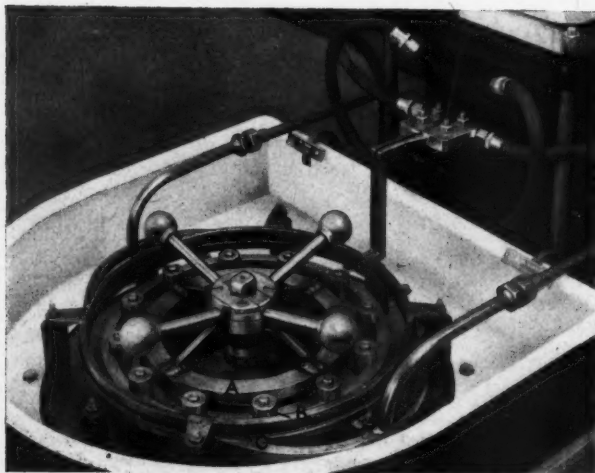


Fig. 1. Wild-Barfield 2-station induction heating machine, for hardening and tempering starter ring gears for motor cars and assembling them to flywheels

entire circumference of the gear is raised to the hardening temperature simultaneously, to reduce risk of distortion. To provide for uniform heating, drive for rotating the work is engaged at the beginning of the cycle, and continues throughout the pre-determined duration of the heating stage.

At the conclusion of this stage, rotation is stopped, and the spider is again moved downwards, to lower the work into the quenching oil which is normally contained in the tank surrounding the working area. Finally, the carrier is returned to the original position, in readiness for unloading.

A close-up view of the fixture at the right-hand station is shown in Fig 2, and it will be seen that a large circu-

Fig. 2. Close-up view of the right-hand station, where the sequence of operations performed comprises heating the gear for tempering, inserting the flywheel, and quenching with water, which is sprayed from a ring distributor

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lar clamp A is provided, the hub of which incorporates capstan handles and is mounted on the threaded upper end of a central, vertical spigot. Prior to loading the work, the spigot is moved axially, to a position somewhat higher than that shown in the illustration, and the entire clamp assembly is removed. The hardened ring gear is then transferred by hand from the first station, and is located by the bore against the sides of pins, which project from the upper end faces of short cylindrical pillars, arranged in a circle, as seen at B. Next, a flywheel is loaded on to the spigot, which locates it radially, and the clamp assembly is replaced and tightened down, to secure the component against a shoulder.

During the automatic cycle at this station, which is also initiated by push-button, the ring gear is first heated to the tempering temperature by the encircling single-turn induction coil C. After a pre-determined period, the heating current is

switched off, and the spigot is then moved downwards, to enter the mating diameter on the flywheel into the bore of the ring gear. Next, water is sprayed from a distributor ring mounted directly below the induction coil, to quench the gear and simultaneously shrink it on to the flywheel. Finally, the spigot is returned to the original position, in preparation for unloading the completed assembly.

Power for the induction coils is taken from separate high-frequency transformers, which are supplied by a Wild-Barfield AHF 25-kW. generator. An automatic, 2-station switching system is incorporated, whereby the generator is kept in continuous use during the cycle of operations, and there are four process timers, for controlling the various stages. To maintain the quenching oil at a constant temperature, it is circulated by a pump through a system which incorporates thermostatically-controlled immersion heaters and coolers.

Drivmatic Automatic Riveting Machines

The General-Electro Mechanical Corporation, Buffalo, New York, U.S.A., have supplied to the U.S. aircraft industry a wide variety of Drivmatic drill-riveting machines for automatically assembling both headed and slug-type rivets. This company also make automatic and semi-automatic work positioners.

An interesting Drivmatic installation is shown in Fig. 1. This equipment is in use at the Long Beach, California, plant of Douglas Aircraft Co., Inc., and incorporates tape control. It is designed to rivet, automatically, 31-ft. long fuselage panels for DC-8 Jetliners. The panels are mounted in a 40-ft. long frame which, during riveting, moves on a 90-ft. long floor track. Tack rivets,

spaced at 5-ft. intervals, are used as synchronizing points when the machine is being operated under automatic tape control.

The operator at the control panel cannot see the riveting ram behind the fuselage panel, and a closed-circuit television system, with two cameras and two monitors, is provided to enable the alignment of the ram with the tack rivets to be checked,

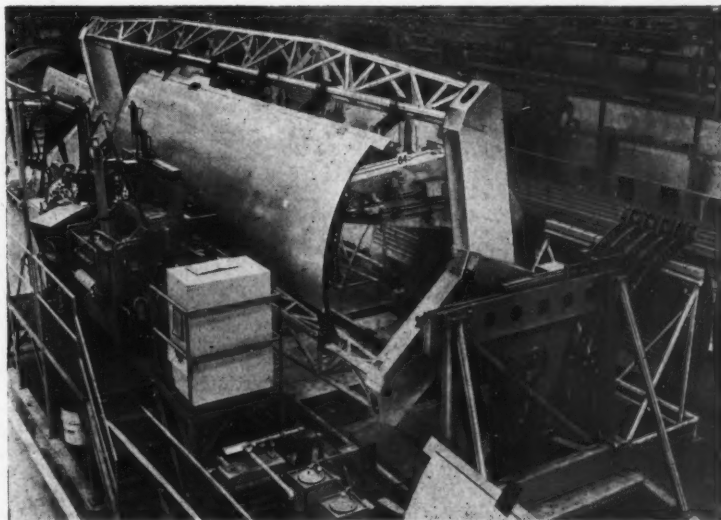


Fig. 1. Drivmatic automatic riveting machine installed in the Douglas plant for riveting fuselage panels for DC-8 Jetliners

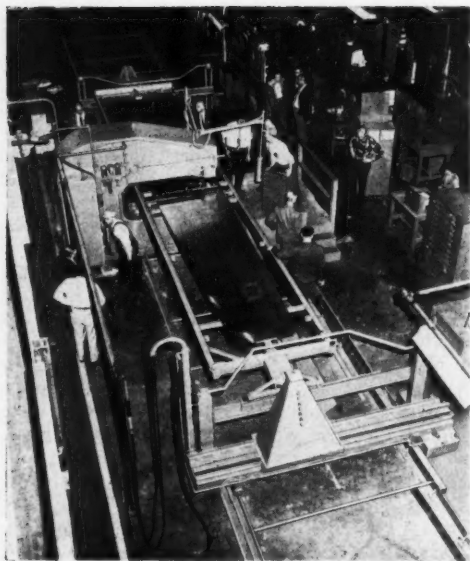


Fig. 2. Drivmatic automatic riveting machine for DC-8 Jetliner wing panels

and to permit the work table position to be adjusted manually, if necessary. During the automatic cycle, the operator can continuously check the machine alignment by reference to the screen. The television system was supplied by TelAutovision Closed Circuit TV, Division of TelAutograph Corp.

Another Drivmatic machine, shown in Fig. 2, which is also installed in the Douglas plant, is employed for riveting $\frac{3}{8}$ -in. thick aluminium skin panels to extruded stringers on 9- by 47-ft. wing sections, which may require as many as 8,500 rivets. The operations performed comprise drilling the hole, countersinking, setting the rivet, heading, and shaving off the top of the head flush with the skin surface. Table motions are controlled by tapes with square punched holes which allow switches, associated with drive clutches, to operate. There are three tapes, one of which controls the longitudinal motion corresponding to the pitch of the rivets in a row. The other two tapes, one for each end of the table, control the transverse motion, and enable the table to be swivelled to produce rows of rivets that are straight but not parallel to each other. These transverse tapes also control a table tilting mechanism which ensures that the rivets are driven at right angles to the curved top surface of the work. The longi-

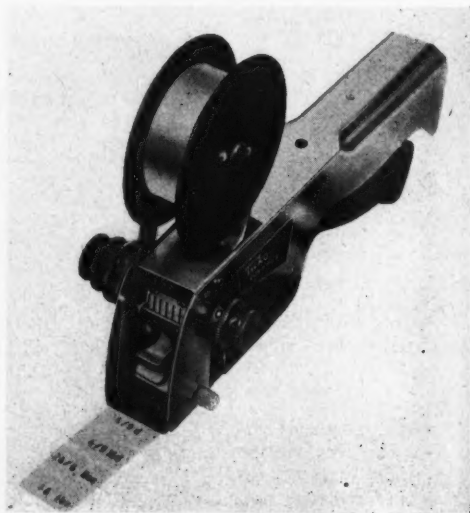
tudinal tape also initiates the cycle of the riveting head, and upon completion of this cycle, the next tape-controlled traverse motion is started. For the combined riveting and work positioning cycle, 30 sec. is required. The throat depth of the machine is 8 ft., and provision is made for swivelling the work through 180 deg. in the horizontal plane so that wide wing sections can be riveted in two stages.

Automation, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11, are sole agents here for the General-Electro Mechanical Corporation.

Tickoply Mini Labelling Tool

For the rapid labelling of parts, with batch numbers, for instance, the Tickoply Mini automatic ticket printing and labelling tool has been introduced by Tickopres, Ltd., 7-8 Old Bailey, London, E.C.4. This unit prints and affixes a self-adhesive ticket in one operation.

In use, the readily-adjustable dials that protrude from the sides of the tool are set, and the lever-type grip below the handle is depressed to print the selected digits on the leading ticket of the reel. Release of the grip causes the printed ticket to be advanced, and the backing paper over the pressure-sensitive adhesive to be partially removed. The ticket is then placed against the surface to be labelled, and, finally, the tool is withdrawn with a downward movement.



Tickoply Mini labelling tool

L.T.E. Chiswick Works

EXTENSIVE RE-ORGANIZATION, at a total cost of £1,250,000, has recently been undertaken at the Chiswick works of the London Transport Executive, which are concerned solely with the overhaul and repair of the principal mechanical and electrical units of motor buses of both the single and double-deck types.

To enable quantity methods to be employed in connection with this work, the number of different types of vehicles has been reduced to a minimum, and the shops are arranged for flow-line operation. At the same time, flexibility has been preserved to provide for introduction of new designs, for which different tools and equipment may be required. For example, electrical power supplies to all machines are taken from an overhead bus-bar system, to facilitate any re-arrangement that may be desirable. Handling has been carefully studied, and wherever practicable conveyors are provided. There is also extensive overhead lifting equipment. Stacking pallets are employed for external transport of complete units, and they are moved within the works by special trucks.

There are now 1,300 production workers in the factory, and an output of nearly 2,000 overhauled mechanical units is obtained weekly. The rate at which individual units are received is unpredictable, and may vary considerably from week-to-week, and it is therefore necessary that the employees should be capable, within particular fields, of undertaking a variety of different operations.

OVERHAUL AND REPAIR METHODS

Units are delivered by lorry, and for the most part—with the exception of batteries—are transferred to wheeled trucks, and are then passed to the adjacent stores, where those of identical types are marshalled into batches.

From the stores, units which require special consideration, such as brakes, fuel pumps, and electrical equipment, are passed directly to individual shops, which are virtually self-contained. The principal units are subjected to a similar pattern of treatment, and in view of the condition in which they are received, ample provision is made for external cleaning prior to dismantling. Further cleaning may be carried out during stripping, if necessary, and all components of these units are then passed to a continuous machine through which they are carried by a flight bar conveyor. In this machine, the work is sprayed first with heated metasilicate solution, and then with heated soda solution for rinsing. Subsequently, a final cleaning treatment is carried out in tanks which are served by 1-ton overhead travelling cranes. Other facilities provided include booths wherein the work is blasted with nut shells, for example, in preparation for crack detection, and a buffing machine. For the removal of rust from the interiors of air receivers for braking systems, which are first degreased in a hot alkaline fluid, quantities of a chemical composition and steel balls are placed inside, and the components—three



Fig. 1. A view in the welding section showing one of the positioners which was designed and made in the works. Heating is provided by a gas muffle ring

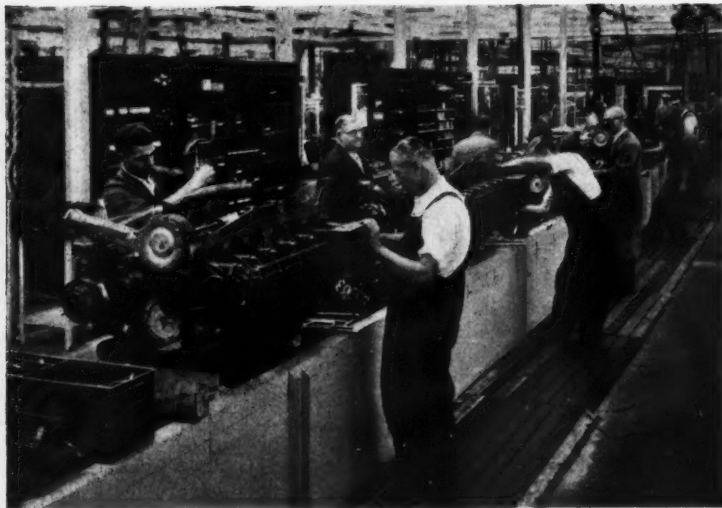


Fig. 2. The engine assembly conveyor is 128 ft. long. Two operators complete each engine, moving with it as it travels along the conveyors

per load—are then tumbled for 1 hour in a special machine, designed and built in the works.

From the cleaning shop, parts for inspection are passed to an adjacent area, where measuring and gauging equipment is provided, also machines for crack detection by the magnetic and fluorescent ink methods, and rigs for water testing cylinder blocks and heads. Parts which require repair are passed directly to an adjoining control stores, where they are marshalled into economic batches, for issue to the repair shops.

Facilities for the recovery of worn parts include a plating shop, with 5 baths for nickel deposition and 4 baths for chromium. In the latter a deposit with a hardness of 800 to 900 D.P.N. is obtained at the rate of 0.0016 in. per hr.

For building-up and repair by welding, oxy-acetylene and electric equipment is housed in a ventilated area. An oven is provided, for pre-heating heavy components, and among a number of heated and unheated stands where gas welding is carried out, attention may be drawn to the positioner shown in Fig. 1, which was designed and built in the works. On this positioner, the work is supported by a table inside the muffle ring, a gap in the latter affording access for welding, and heat is provided by a number of gas jets. Hinged arms are incorporated, to retain the work on the table, and the entire unit is pivoted on a horizontal shaft mounted on the fabricated frame,

and can be tilted by means of a large hand-wheel. The work-table can also be rotated, by means of a treadle, to facilitate building-up poppet valve seats, for example. Preparation for welding, and subsequent fettling, are performed in an area adjacent to the welding shop, where shot blasting equipment and two booths for metal spraying are also provided. In these booths, for example, all road wheels are zinc-coated, to prevent tyre adhesion.

There are 127 machine tools in the general machine shop, which are arranged, for the most part, according to type. A small flow line has, however, been

established on which worn liners are pressed out of cylinder blocks, and fresh liners inserted. The latter are then bored and honed to a surface finish of 35 to 40 micro-inches. Cutting fluid is supplied to the eight fine boring machines in this line from a centralized, underground tank.

Repaired parts are delivered to one or other of two stores in readiness for re-assembly, and owing to the high standards maintained, interchangeability is ensured. In these stores, also, parts which are unsuitable for building-up, and have consequently been re-conditioned by machining to one of three smaller sizes, are matched with suitable mating components. From one of these pre-assembly stores, components are issued to serve an area in which sub-assemblies for engines are built up, and then passed to a further stores. The final assembly of engines is performed on a 128-ft. long conveyor, as seen in Fig. 2, on which supporting cradles are mounted at intervals of 9 ft. 6 in. This conveyor travels at a speed of about 3 in. per min., and each engine is assembled entirely by a pair of operators, who follow, working on opposite sides of the conveyor. Components are taken from racks seen in the background, located at the required positions.

Before being released for service, each engine undergoes a test run. As a result of developments at Chiswick and other establishments, it has been possible, during the past ten years, to reduce the

number of employees engaged in bus overhaul, maintenance, and servicing, from 1.5 to 1.13 per vehicle. At the same time, the number of spare buses held to cover maintenance and other needs

has been reduced from 9 per cent to 5 per cent of the fleet, and there has been a 17 per cent reduction in total costs per mile run for bus overhaul and maintenance.

English Electric Quality Control System for Sheet Metal

A new quality control system for the sheet steel and tinplate industries, introduced by the Metal Industries Division of the English Electric Co., Ltd., English Electric House, Strand, London, W.C.2, involves the use of a classifier for sorting sheared sections of cold rolled strip and rejecting faulty pieces. Faults such as pinholes, errors in gauge, and poor surface finish are detected during the inspection of the continuous strip, but sorting into grades can only be carried out when the strip has been cut into individual sheets. The sheet classifier stores the information concerning strip quality which was obtained at the time of inspection, and uses it when the cut sheets are being sorted into piles. Information is stored and processed by standard transistorized logical elements known as Datapacs.

From these standard elements, a sheet classifier system of any size and complexity can be built up, for a line operating at any speed, to cover cut lengths with a ratio of as much as 10/1. The first units will shortly be installed on No. 5 cut-up line at the Abbey Works of the Steel Co. of Wales, Ltd., and on two cut-up lines at the works of Richard Thomas & Baldwins, Ltd., at Ebbw Vale. A further unit is to be installed in a South African steel-works.

At the Abbey Works, the classifier will be used in conjunction with a line operating at 700 ft. per min., for cut lengths ranging from 40 to 180 in., and the material will be sorted into rejects and prime sheets. On two tinplate lines at Ebbw Vale, both operating at 1,000 ft. per min., and with cut lengths ranging from 18 to 42 in., there will be four classifications, namely sheets with pinholes, off-gauge material, other rejects, and prime sheets.

The accompanying illustration shows, diagrammatically, the arrangement of a typical system. Datapac standard logical elements are in the form of standard plug-in packages. Each package contains a number of elements capable of performing specific logical functions, and each element can operate from the output of the preceding element, so that a series can be arranged to form any desired logical system.

Faults detected by the instruments are stored in the first shift register at a point corresponding to the instrument position. Shift pulses in time with the conveyor movement are applied to the register so that the fault signal moves within it in time with the movement of the faulty section of strip on the shearing line. The signal transfers from the register to "store 1" when the fault passes the shear position. This signal then indicates that the next sheet to be cut is a reject.

When the sheet is cut, the operation is detected by a device which causes the signal to be transferred from "store 1" to "store 2", and this transfer indicates that the last sheet cut is a reject. The leading edge of this reject sheet is now detected by one of the leading-edge detection

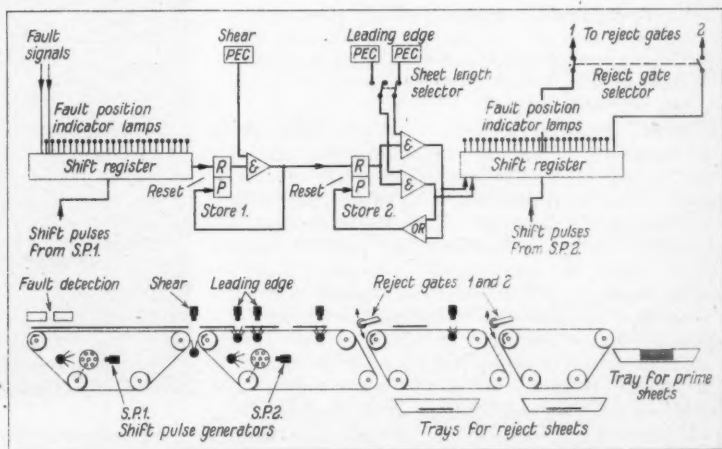


Diagram showing the arrangement of a typical English Electric sheet metal classifier

photocells and the signal is transferred to a suitable position in the second register. Subsequently, this signal is shifted within the second register, so that it appears at a reject gate just before the leading edge of the sheet reaches the gate. Finally, the signal is used to instruct the gate control to reject the sheet when its leading edge reaches the gate photocell.

Two leading edge photocells are provided after the shear to cover the range of sheet lengths. One is employed for short sheets, the other for long sheets. Either photocell is suitable for sheets of medium length. Selection of the photocell is effected automatically by the shear cut length setting. Normally, mechanical reject gates are used, but more complex methods, such as overhead magnetic conveyors with variable drop off points at the pile positions, can be provided if required.

Reactor Refuelling Machine

To provide for removing and replacing fuel elements for the advanced gas-cooled reactor at Windscale, John Brown (S.E.N.D.), Ltd., have designed, in conjunction with the Atomic Energy Authority, a machine which enables this operation to be performed while the reactor is under full load and pressure. Measuring 61 ft. high, and weighing approximately 400 tons, the machine is shown in the accompanying figure in the final stages of erection in the works of Markham & Co., Ltd., Chesterfield. It will subsequently be dismantled, for transportation to the site, where it will be erected above the reactor, which incorporates 253 vertically-mounted branch refuelling pipes. Provision is made in the design for reducing the machine to units which can be passed through a 10-ft. diameter air lock, by which access is gained to the reactor building.

Handling of the elements is usually carried out by means of a "normal" pressure vessel, and at the beginning of a refuelling operation, a nose-piece is extended downwards to effect a seal with the selected branch pipe. The spent element is then hoisted into a chamber in a 3-position magazine, which is subsequently indexed about a vertical axis, to permit the fresh element—carried in another chamber—to be lowered and locked in position in the reactor. The third chamber can accommodate a stand-by seal plug for the reactor. A second pressure vessel contains another 3-chamber indexing magazine, which is employed for withdrawing and housing the portions of a spent fuel element that has broken. Provision is made for viewing the operation through closed circuit television, and a CO₂ cooling system is incorporated,

to ensure continuous removal of heat from the spent elements prior to disposal.

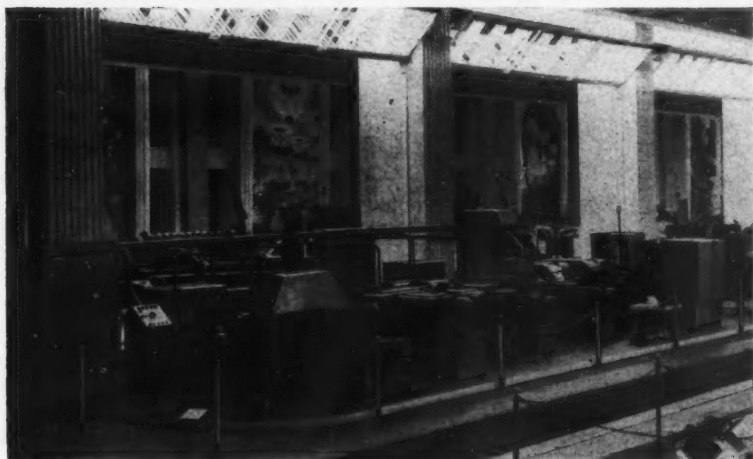
For co-ordinate positioning within the area occupied by the ends of the charge tubes, the structure supporting the pressure vessels is mounted on a wheeled crab, which in turn, is carried by a wheeled gantry. Initial setting is made under manual control, at a traverse rate of about 10 ft. per min., and the final positioning is performed entirely automatically. During the latter stage, the distance from the selected pipe, and the direction in which movement is required, are detected by sensing units carried in the nosepiece of the magazine in use, which is lowered for measuring purposes. Motion is applied at a rate which varies according to the approach distance, under servo control, and it is claimed that steady movement is obtained at speeds down to 0.006 in. per min. The accuracy of the entire traversing system is such that during recent tests, positioning was effected to within 0.002 in. The electrical control equipment incorporates extensive interlocks, to ensure that each stage of a refuelling operation is completed before the next can be initiated.



Measuring 61 ft. high, and weighing about 400 tons, this machine will be employed for removing and replacing fuel elements while the Windscale gas-cooled reactor is under full load

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A Russian Automatic Transfer Machine Shown at the Leipzig Fair

By R. E. GREEN, Associate Editor

IN EARLIER ARTICLES IN THIS SERIES* reference has been made to some of the more interesting machine tools shown by the East German industry at this year's Leipzig Spring Fair. Three further articles† have been concerned with the range of standard machine tools exhibited in the Russian pavilion, and with an automatic in-line transfer machine for operations on oil filter housings. This latter machine, of the platen-fixture type, provides for a series of drilling, counterboring, boring, facing and tapping operations on aluminium-alloy housings, which are completed at the rate of 1 per min.

In addition, a second in-line transfer machine, of similar size, was shown. This machine, a general view of which is given in the heading illustration, has been built for operations on cast iron bearing caps for diesel engines. Like that already described, the bearing cap machine was designed and built by the Ordzonikidze Machine Tool Factory in Moscow, and it is designated ID 107. With a cycle time of 44.5 sec., the machine has an

output of 65 sets of bearing caps per hour at 80 per cent efficiency, each set comprising five caps.

MACHINE LAYOUT AND OPERATING SEQUENCE

In the heading illustration, the machine is shown with the loading end at the left, and it has a total of eight stations at which machining operations are performed. There are 13 unit heads, from the standard range produced by Ordzonikidze, for milling, drilling, spot-facing and tapping operations, and the total number of spindles is 85. Power is supplied by 25 separate motors, including those for the floor-mounted hydraulic pump units.

Examples of the one-piece cluster castings from which the bearing caps are machined are seen in Fig. 1. In accordance with current practice in Western countries, the casting provides a complete set of caps, and as much machining as possible is completed prior to separation, as shown by the example in the right foreground. The block is then cut into five separate bearing caps, as seen to the left, at the final station of the machine, which are discharged on a conveyor. Because the

* MACHINERY, 98/939—26/4/61, 98/1006—3/5/61, 98/1074—10/5/61 and 98/1119—17/5/61.

† MACHINERY, 98/1103—24/5/61, 98/1251—31/5/61 and 98/1293—7/6/61.

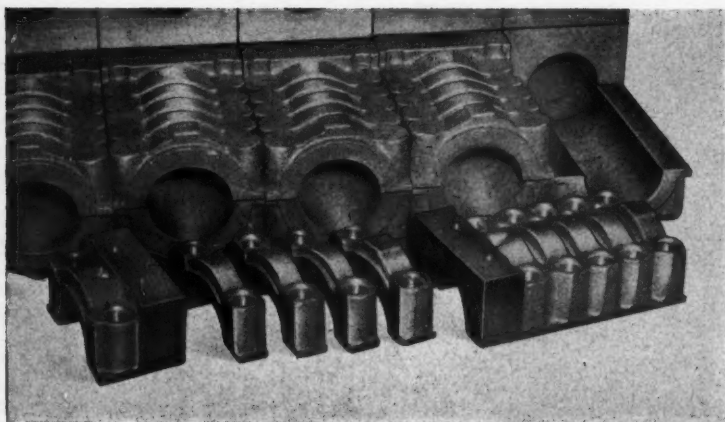


Fig. 1. The cluster casting, at the right, from which the five diesel engine bearing caps (left) are machined, measures about 8.25 by 5.25 by 2.5 in., and is delivered to the transfer machine with the long sides and half bore already milled

machine was operated only intermittently at Leipzig, certain of the machining stations were photographed without castings in position. After a few sets of caps had been produced, the cutting-off stations was rendered inoperative, and partly-machined castings were then recirculated.

Before being delivered to the transfer machine, each block casting is faced on the two long sides and on the joint surfaces, and the half bore is machined to a diameter of about 3 in. In this condition, each casting measures about 8.25 by 5.25 by 2.5 in. After machining has been completed, each small cap is 1 in. thick, and the end caps are 1.25 and 2.75 in. thick respectively. Holding-down bolt holes in each cap are drilled to approximately 0.56 in. diameter, and are countersunk at the joint face and spot-faced at their outer ends. Bearing retaining slots are milled in each cap, and the larger end cap also has two oil seal grooves in the half bore.

and his duties are confined to feeding castings to the first transfer position, and general supervision. There are four separate transfer bars on the machine, as indicated in the diagrammatic plan view in Fig. 2, to provide for various machining station arrangements, and the first bar serves only the first machining station and the drum-type turn-over unit beyond. This bar is seen at A in the close-up view of the first machining station in Fig. 3, and it comprises two lengths of L-section steel, held apart by spacers to accommodate the spring-loaded pawls whereby the castings are moved along the transfer track.

Suspended and guided on rollers at each side, above the centre of the transfer track, the bar is connected to the ram of a hydraulic cylinder B, secured to a bracket within the turn-over unit housing. The transfer track served by this first bar has an initial portion, at the right in Fig. 3, with rollers on which the fresh castings are placed

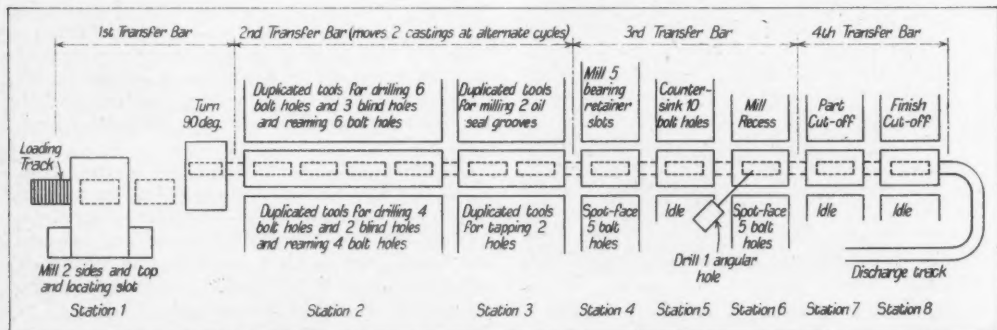


Fig. 2. Diagrammatic layout of the Ordzonikidze transfer machine for operations on diesel engine main bearing caps showing the arrangement of the machining stations and the four transfer bars

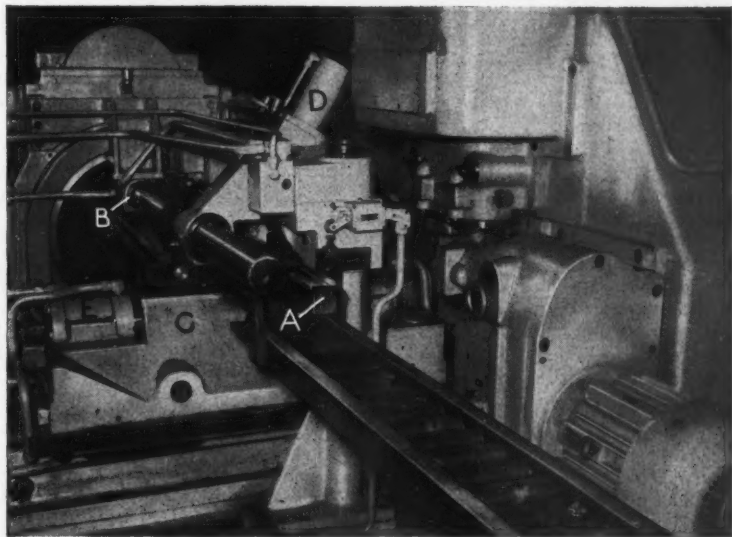
by the operator and pushed up to a spring-loaded stop. As the transfer bar moves towards the camera, during the machining cycle, the stop is automatically retracted upwards by a cam on the bar, and at the next transfer movement, the casting is carried to the first machining station.

The transfer track has a central tenon to guide the casting, which is loaded, initially, with the half-bore downwards and the large bearing cap leading. At the first machining station, the transfer track is formed by surfaces on a hydraulically-operated slide C. This slide forms the table of the first milling unit and is carried on a bed unit at right angles to the track. When this slide is moved to the position shown, the surfaces are aligned with the remainder of the track, and the operation of the transfer bar moves the casting on to the slide. The transfer bar has a

seen near the left in the heading illustration. There are three somewhat similar spindle heads, with separate driving motors, for facing operations, and a fourth head, within the bridge opening, machines a 0.25-in. wide, locating slot in the edge of the joint face of the smaller end cap. The face-milling head above the slide has two spindles and each side head one spindle, and all the spindles are fitted with similar face-milling cutters, of about 4 in. diameter, with 10 carbide-tipped inserted blades. These cutters are arranged to machine a flat face on top of the casting near each end, also the two vertical end faces.

At the end of the traverse of the slide, the casting is carried into engagement with the milling

Fig. 3. At the loading station of the bearing cap machine, the casting is moved into a portion of the transfer track carried on a slide, clamped, and fed transversely to the milling cutters on the housing at the right



fixed stroke which serves to position the casting roughly in the longitudinal direction, and final location is ensured by an inclined cylinder D, above the loading station.

The ram of this cylinder carries a wedge-shaped plunger which is inserted between two of the curved outlines of the small bearing caps, in the top face of the block, when the cylinder is actuated. Centrally-pivoted, lever-type, clamps of T-shape are then applied to the holding-down bolt bosses at each side of the casting by the action of hydraulic cylinders on the slide, as at E.

MACHINING OPERATIONS

With the clamps applied, the slide is fed to the right, away from the transfer track, and the casting is carried past the milling heads, which are secured to faces on the massive bridge casting, clearly

cutter for the location slot, which penetrates to a depth of about 0.35 in. After the slide has returned to its original position the clamps are released, and at subsequent movements of the transfer bar, the casting is carried to an idle position, and then into the turn-over unit beyond. This unit, of the drum type, has a hydraulically-operated rack at the top, the teeth of which are engaged with gear teeth on the drum. The portion of the transfer track within the drum is displaced from the centre, and when the drum is turned through 90 deg., the casting is carried downwards and held with the half-bore to the left, resting on one of the side faces.

In this position, the casting is held directly beneath the second transfer bar, which is similar

in design to the first, in line with a narrower track having guide faces at each side. This transfer bar is operated by a long-stroke hydraulic cylinder, carried on a bridge member above the third machining station, and the casting passes through three idle positions after leaving the turn-over unit.

DUPLICATED DRILLING AND REAMING STATION

The next operations performed, at station 2 in Fig. 2, are the drilling and reaming of the holding-down bolt holes from the solid, and are carried out on two castings simultaneously, at two successive stages. Because of the shortness of the cycle at the majority of the machining stations, and the length of time required to penetrate 2.5 in. of cast iron without using feed rates so high as to cause excessively rapid tool wear, the drilling and reaming heads (also the heads at the third machining station), are duplicated and are arranged to operate during two full cycles, so that the time for these stages is 89 sec. To provide for this double cycle, the second transfer bar operates only at alternate cycles of the remainder of the machine, and it moves through twice the stroke length of the other bars so that two castings are advanced at a time.

Close spacing of the bolt holes makes it necessary to drill alternate pairs of holes from opposite sides of the track, and the unit heads employed, which are from the standard Ordzonikidze range, are fitted with extra long spindle adapters designed to cover four casting positions. A view showing this

second—multiple—machining station from the right-hand side of the track is given in Fig. 4, which also shows the transfer cylinder in the background and the clamping arrangements. When the transfer bar is operated, two castings are moved from the idle positions at the left (here unoccupied), to positions directly opposite the two cylinders *F*, whereby the clamps are applied.

Location of the castings at these positions is obtained by means of plungers which are raised into engagement with the locating slots in the now downward-facing edges of the joint surfaces, by hydraulic cylinders in the bed unit. The clamps are then applied by the cylinders *F*, through vertical levers, pivoted at their lower ends. Cross beams on these levers carry plungers which pass through holes in the bush plate and apply pressure directly to the curved rear faces of the castings, to hold them in contact with support faces on the opposite side of the track.

The multi-spindle head on the far (left-hand) side of the track has two sets of nine spindles, which operate on the castings clamped by the cylinders *F*. Six spindles of each set are employed for drilling holding-down bolt holes, and three for drilling smaller, blind holes, one in the half bore and two in the joint faces of the larger end cap. Two sets of spindles in the head in the foreground are employed to drill the four remaining bolt holes, and two blind holes in the flat (outer) face of the larger end cap, in each of the two castings.

When the castings are transferred to the reaming positions at this station, they are again located by the slots and are clamped hydraulically by a mechanism which is similar to that provided at the drilling positions, except that both clamps are applied by a single cylinder *G*, through a lever of cruciform shape. At the far side of the track, the head has two sets of six spindles with reamers for operations on the bolt holes drilled at the two previous posi-

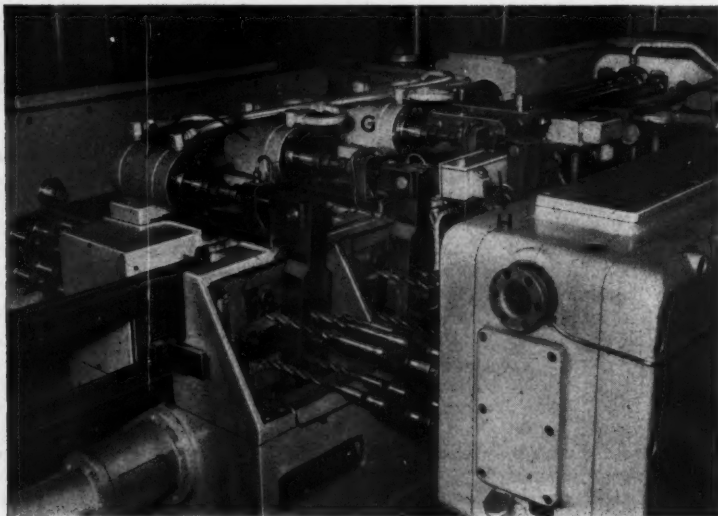


Fig. 4. After passing through the turn-over unit, in which it is turned on to its side, the cluster casting reaches this station where drilling and reaming operations are duplicated

Fig. 5. The turn-over unit is seen in this view looking back along the transfer machine from station 3 in the foreground. The second transfer bar is moved by the hydraulic cylinder *J*

tions. Spindles in the head in the foreground are employed to ream the four holes in each casting drilled previously from this side. This head also carries two sets of probes which enter the two small holes in the top face of the larger end cap of each casting to ensure that they have been drilled to a sufficient depth for safe tapping at a later stage.

It may be noted that provision is made for automatic lubrication of all moving parts of the machine by means of several hydraulically-operated pump units, which deliver oil from a reservoir along pipelines leading to various points. The units are standardized, and one example is indicated at *H*, in Fig. 4.

GROOVE-MILLING AND TAPPING OPERATIONS

Two idle positions follow those at which reaming is carried out before two castings are moved into the clamping positions of the third machining station, seen in the foreground in Fig. 5, where the operating cylinder for the second transfer bar is indicated at *J*. Location of the castings at this and subsequent stations is obtained by means of plungers which

engage reamed bolt holes, the plungers being advanced by a hydraulically-operated mechanism at one end of the bed casting. Clamping force is applied by horizontal, rectangular plungers, which are moved into contact hydraulically with the curved rear faces of the castings, to press the joint

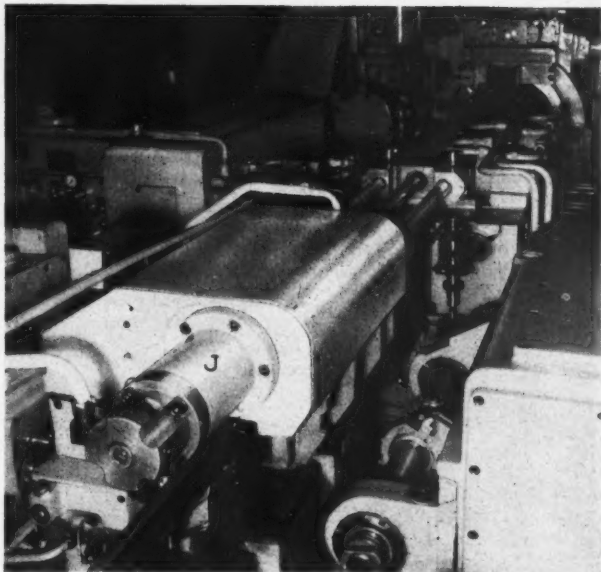
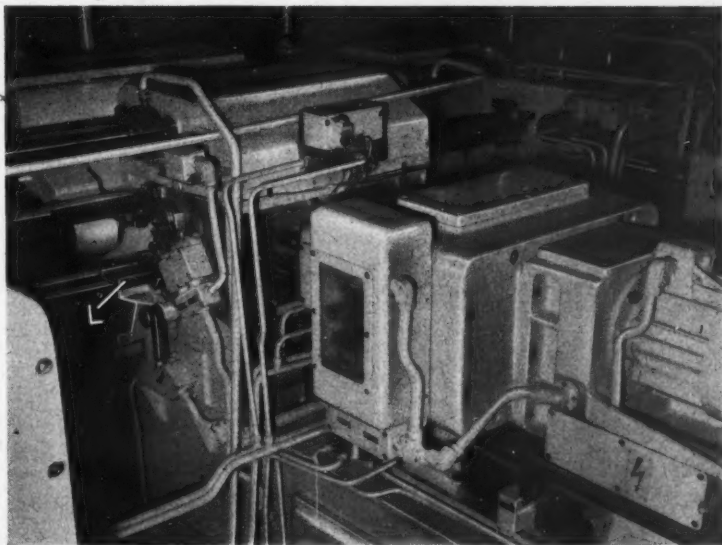


Fig. 6. Another view of station 3, from the right-hand side of the track, showing the head, with four spindles, for tapping two holes in each of two castings, and the retractable portion *L* of the transfer track



faces against projecting shoulders on the opposite side of the track.

The head at the left of the track, as viewed in the direction of transfer (seen at the right in Fig. 5), is equipped with a milling adapter incorporating a spindle with two pairs of narrow milling cutters. These cutters are fed forward to plunge-cut the oil seal grooves in the leading—larger—end cap of each block casting, to widths of approximately 0.25 and 0.19 in., and depths of 0.75 and 0.25 in., respectively. A view of this station from the right-hand side of the track is given in Fig. 6, and shows the tapping head which has two pairs of spindles

restored to its original position after the milling head has been retracted, to restore continuity of the track for the next transfer movement.

MILLING AND SPOT-FACING OPERATIONS

On leaving the third station the castings pass through two more idle positions before they are moved, one at a time, to the fourth station, which provides for milling the bearing retainer slots in one side of the half bore and spot-facing five of the holding-down bolt holes. The station is shown in the foreground in Fig. 7, and the castings are

moved by the third transfer bar, which is actuated by the cylinder K, at the fifth station. Location and clamping arrangements are similar



Fig. 7. With station 4 in the foreground, this view also shows station 5, for chamfering all 10 bolt holes at the joint face, and station 6, at which there is a vertically-traversing milling head

to those at the previous station, except that the clamping cylinder is mounted above instead of beneath the work holding unit.

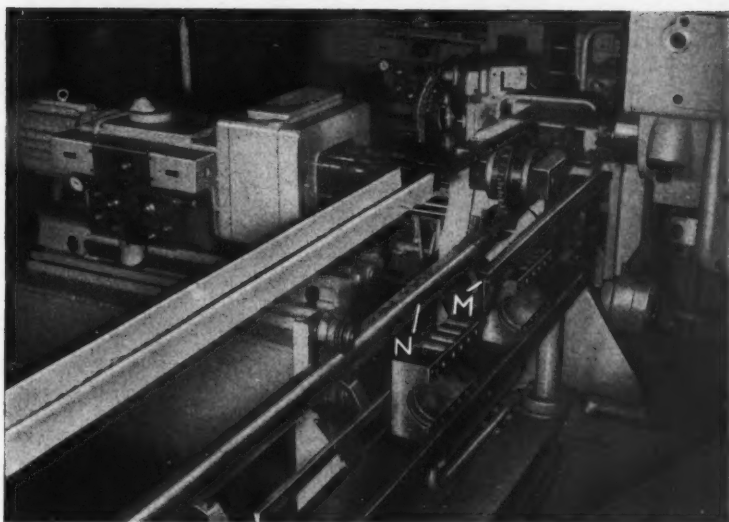
The adapter on the head at the left-hand side is equipped with a spindle with five milling cutters of about 2.5 in. diameter by 0.25 in. thick, which are advanced to cut the bearing retaining slots in the upper edge of the half bore. Before the head is fed forward, the transfer tracks at each side of the holding unit are lowered, as before, and they are raised again after the milling operation has been completed. The head at the right is provided with a 5-spindle adapter, with spot-facing cutters which operate on two of the upper and three of the lower bolt hole bosses.

Two further idle positions follow, before the casting is indexed to the fifth machining station, where it is again located from the bolt hole and clamped by the action of a cylinder at one side. The left-hand head at this station has ten closely-spaced spindles which are employed to chamfer the joint-

for operation on the two small holes drilled in each casting at the previous station. With this head, the tapping cycle is controlled by a stop disc, driven from the spindle.

As the milling head on the opposite side of the track is fed towards the castings, the bearing housings for the spindle move into a position in which they overlap the transfer track at each side of the clamping unit. Provision is therefore made at this station, and others at which milling operations are performed, for the interfering portions of the track to be automatically retracted during the machining cycle. One such retractable portion of track is seen at L in Fig. 6, and it is secured to a bracket on a horizontal shaft which passes through the bed unit and carries a similar bracket at the other end. At the start of the machining cycle, the shaft is turned by a hydraulic cylinder, and it is

Fig. 8. This view, looking back towards station 6, shows the vertically-traversing milling head and the spot-facing and angular heads. The third and fourth transfer bars are seen at *M* and *N*



face ends of the bolt holes. There is no head at the right-hand side at this station.

After passing through two more idle positions, the casting is moved into the sixth machining station, where it is located and clamped as before. A column at the left-hand side at this station carries a vertically-moving milling head with a horizontal spindle carrying a 3-in. diameter face-milling cutter. The support surfaces to which the casting is clamped at this station are cut away at a position adjacent to the larger end cap to provide clearance for the cutter, which machines a shallow recess in the face for a distance of about 1.25 in. from the end of the casting.

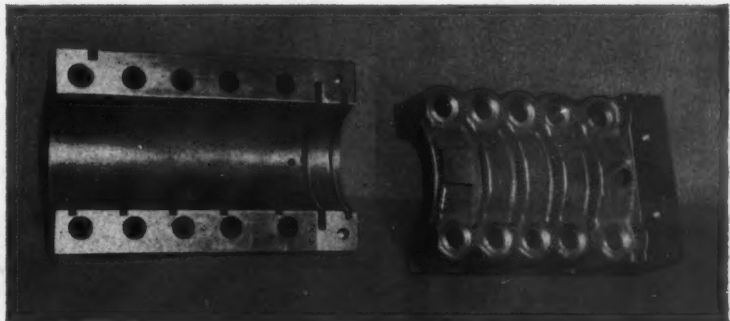
At the right-hand side of station six there are two heads, one of which has five spindles and is employed to spot-face the remaining bolt hole bosses. This head is seen at the left in Fig. 8, which is a view looking back along the line. The other head at this station, seen at *L*, is arranged at an angle to the line. A single spindle in this head is fitted with a drill of about 0.45 in. diameter, which produces a hole in the rear face of the casting. This hole is drilled to such a depth that it breaks into the hole drilled in the half-bore at station 2, and into the larger of the

two oil seal grooves in the larger end cap. Examples of castings in the condition in which they leave station 6 are shown in Fig. 9.

CUTTING OFF OPERATIONS

The two remaining stations provide for parting the block casting into five separate bearing caps, as seen at the left in Fig. 1, and are served by the fourth transfer bar. This bar is arranged to move the castings through a longer stroke length than the previous bar, because the stations are more widely spaced to suit the extra width of the milling units employed. In Fig. 8, the end of the third transfer bar is seen at *M*, the castings in the foreground being in approximately the positions to which they are moved by this bar after the completion of the operations performed

Fig. 9. Examples of partly-machined castings, showing the stage to which they are brought by the operations performed at the first six stations



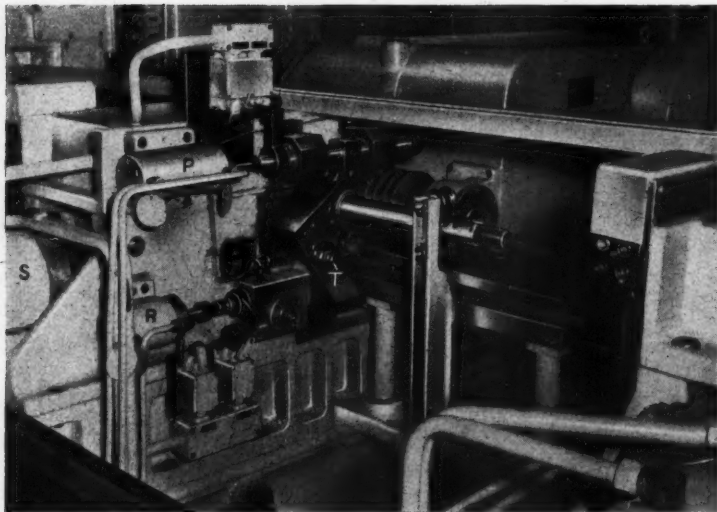


Fig. 10. This view, looking back at the seventh station, shows the cylinder P for turning the fourth transfer bar to bring the fixed projections into engagement with the castings, and the massive milling head on the far side of the track

at station 6. The fourth transfer bar is seen at N, and it is of cylindrical form with fixed projections whereby the castings are pushed along the track.

This bar is carried in grooved rollers on brackets extending upwards from bars which connect the bed units, and is coupled at each end to a length of roller chain which is supported in a steel channel. The chain passes over sprockets mounted on brackets at station 6 and at the unloading end, the latter sprocket being carried on a spindle which can be turned by means of a hydraulically-operated rack and pinion arrangement. When the ram of the vertical hydraulic cylinder is operated, the bar is moved longitudinally to transfer the castings. Rotary movement of the bar, to move the transfer projections into or out of engagement with the castings, is imparted by a hydraulic cylinder on the side of the clamping unit at station 7.

This cylinder is seen at P in Fig. 10, which is a close-up view of station 7, looking back along the track, and the

the plunger so that when the cylinder is actuated, the bar is turned. Another cylinder R, on the side of the head, is connected to a rack and pinion system whereby a shaft is turned to advance the locating plungers into the bolt holes.

For clamping the casting, a large-diameter cylinder S applies thrust directly to the rear, to hold the joint surface in contact with slotted faces on the other side of the track. On the far side

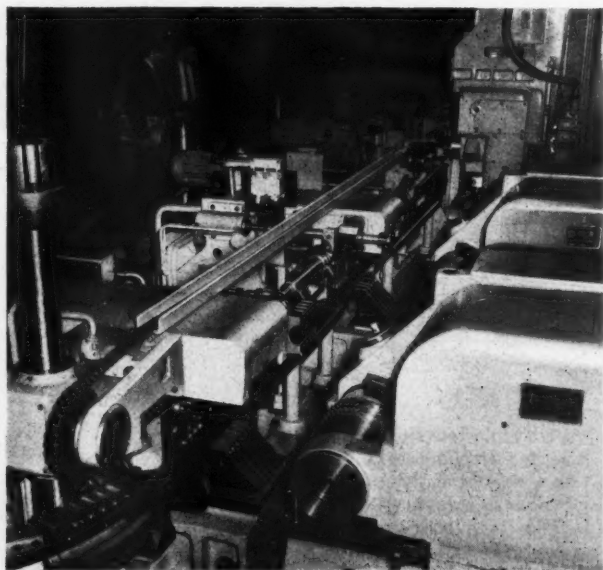


Fig. 11. The actuating mechanism for the fourth transfer bar comprises a length of roller chain and two sprockets, one of which is turned through rack and pinion by the vertical hydraulic cylinder at the left

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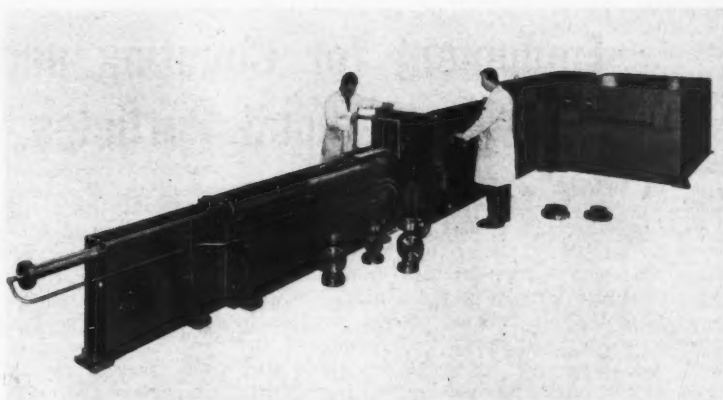
of the unit, in a position similar to that occupied by the cylinder *R*, there is another cylinder, the ram of which is connected by a link to a shaft passing horizontally through the housing. The end of this shaft is seen at *T*, and it carries levers which are welded to movable portions of the transfer track at each side of the clamping position. Before the milling unit is fed forward partially to sever the caps, these portions of the track are moved downwards to clear the milling spindle housings, and they are subsequently restored to position for the next transfer movement.

A more general view showing the transfer mechanism, and the vertical hydraulic operating cylinder at the left, is given in Fig. 11, looking back along the line, and the two milling units are seen on the right. The spindle of each head is fitted with four slotting cutters of about 6 in. diameter by 0.25 in. thick, with 60 teeth. These cutters are driven at approximately 30 r.p.m., and the heads are advanced rapidly to bring them to the working positions. The total thickness of the castings is about 2.5 in., and the cut is shared approximately equally between the two gangs of cutters. Finally, the castings are discharged from the machine along a curved chute.

A large rotary selector switch and push-buttons on a panel near the loading station provide for control and adjustment, as on the machine described in the previous article. There is also a tool control board with counters which are operated from the various stations so that the numbers of cutting cycles are automatically recorded, and a spare set of tools in pre-set holders is accommodated alongside each counter dial.

Special Lapointe Horizontal Hydraulic Broaching Machine

The accompanying illustration shows a horizontal hydraulic broaching machine which has been built by Lapointe Machine Tool Co., Ltd., Otterspool, Watford By-Pass, Watford, Herts., to the specification of Cameron Ironworks, Ltd., Queen Street,



Built to the specification of Cameron Ironworks, Ltd., this Lapointe horizontal hydraulic broaching machine is considerably lower than normal, to facilitate broach handling

Leeds, 10. It is intended primarily for broaching rectangular cavities in forged steel bodies for gate valves, for oilfield equipment, which range in nominal size from 2 to 6 in. and will withstand pressures up to 15,000 lb. per sq. in. Provision is made for accommodating either individual bodies, examples of which are seen in the figure, or blocks for multiple units, and as an indication of capacity, it is stated that when the full stroke of 100 in. is employed, a starting hole of $2\frac{1}{8}$ in. diameter can be enlarged to an aperture with cross-sectional dimensions of $5\frac{1}{2}$ by $2\frac{3}{4}$ in., with a total of 14 passes.

To facilitate handling the large number of broaches which is required during the progress of an operation, the height is considerably less than that of a normal Lapointe machine. For this reason, it proved impossible to mount the tanks for hydraulic fluid in the base, and they are housed, together with other hydraulic equipment and the associated motors, in a power unit which is attached to one end. Broaching speeds from 1 to 21 ft. per min. can be obtained, in three ranges, and are selected by push-button. Provision is made for guiding the trailing end of the broach throughout the stroke. Coolant equipment is incorporated, and the reservoir is housed in a pit in the shop floor, directly below the working area.

This machine, which is approximately 38 ft. long and weighs $13\frac{1}{2}$ tons, is to be installed in the works of the French company of Cameron Ironworks, Ltd., and has been despatched by way of the recently-introduced door-to-door Channel ferry service.

Equipment for Counting and Sizing Diamond Particles

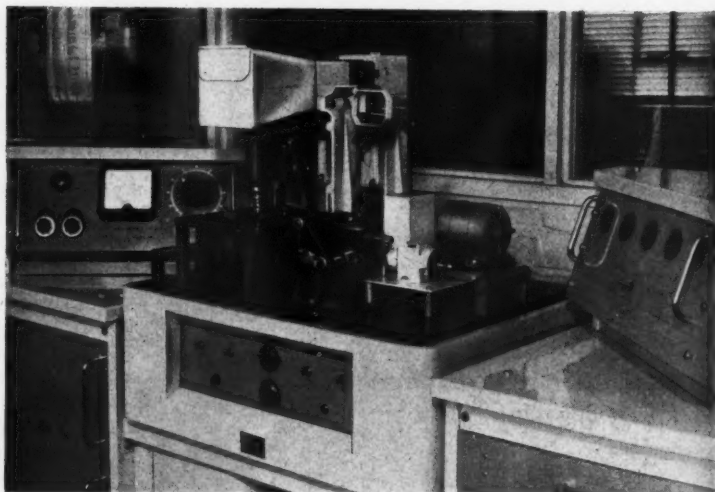
DIADUST, LTD., one of the companies in the L. M. Van Moppes & Sons, Ltd., Group, are concerned with the processing, testing, weighing, and packing of diamond powder, produced from boart, for use in industry throughout the world. The preparation of Diadust diamond powder is a 4-stage process which starts with the crushing of the boart into fragments not exceeding about 0.01 carat weight. Material thus obtained is treated in order to remove impurities present in the natural boart and foreign matter picked up during crushing. At the third stage, the larger particles are separated from the mass by sieving into coarse, medium, and fine divisions, each of which is then sub-divided into seven grades of decreasing coarseness. A total of 21 mesh grades is thus obtained, which are suitable for use in grinding wheels, stone cutting saws and impregnated drill-ing bits.

Finally, the residue of the crushed diamond powder is separated by a carefully controlled combined elutriation and sedimentation process of long duration into 13 coarse, medium, and fine sub-sieve or micron size grades, the finest of which is composed of particles measuring less than 0.5 micron (0.0005 mm.) in diameter. The sub-sieve grades of powder are widely employed in lap-ping and polishing pro-cesses, as required, for example, in the produc-tion of tungsten carbide dies, gauges of hardened steel, optical glass parts, and synthetic jewel bear-ings.

In the elutriation and sedimentation process, the buoyant force of a moving stream of water is employed for the separation and distribu-tion of the finely-divided diamond particles in a number of cone-shaped glass vessels, connected in series, so that the

coarsest particles remain in the first vessel and the balance of the powder is carried over and deposited successively in the other vessels in decreasing order of particle size. The contents of the sedimentation vessels are removed and dried prior to particle size determination which is regarded as being of great importance, since it is the means of controlling uniformity in each grade throughout the range.

The size analysis of sub-sieve particles of diamond powder by traditional methods which rely on bench type and projection microscopes is lengthy and tedious, and it may now be performed automatically by the use of electronically controlled equipment designed to count and size particles of matter with diameters as small as one micron. It may be mentioned here that for one of the earlier methods of particle size analysis em-ployed by Diadust, Ltd., a highly magnified image of part of a carefully prepared sample of diamond powder was projected on to a translucent glass screen for direct visual observation by eye, and the numbers of particles of various sizes counted on the screen were recorded. Such an analysis was neces-



Casella automatic particle counting and sizing equipment installed at the works of Diadust, Ltd.

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sarily conducted slowly in order to reduce errors of observation and recording, and usually required the participation of two persons. With the modern equipment now employed by the company for this work, however, an analysis can be obtained in less time and to a higher standard of accuracy by one operator, under improved conditions and without undue fatigue. The equipment, which is shown in the accompanying illustration, is known as an automatic particle size analyser, and is a product of Casella (Electronics), Ltd., Haxby Road, York. Briefly, the required result is obtained by scanning to and fro along a narrow sinusoidal track which traverses an area covered by a dispersal of diamond powder. The magnified image of each successive particle encountered is transmitted through a calibrated slit on to a photo-multiplier which is adjusted to give standard maximum and minimum signals corresponding to nil and total obscuration of the slit.

Particle images are projected by a microscope, with a magnification of $220\times$, illuminated by a Kohler light system which is so arranged as to avoid variations in lamp output. The width of the slit opening in front of the photo-multiplier may be varied by a micrometer adjustment from 0 to 10 mm., and is set to a specific value when the magnification of the optical system is altered. Filters, held in a turret, are employed in conjunction with the gain and dark level controls to measure the optical density of the particles and thus eliminate the effects of opacity.

Output of the photo-multiplier is fed into a pulse height discriminator which may be regarded as an electronic gate and can be adjusted to pass a pulse to the counting circuit only when a certain proportion of the slit is obscured by a particle. The discriminator adjustment is made by means of a potentiometer which has settings marked from 0 to 1, and any figure may be chosen to represent the minimum particle size which will be recorded during a scanning run.

The stage on which the specimen of diamond powder is mounted is supported on vertical leaf springs and reciprocated from side to side by a cam and lever mechanism, and the forward and rearward travel of the stage is derived from a gear train. Drive to both motions is provided by an f.h.p. motor. During the counting operation, scanning of the specimen takes place over 10-mm. long paths, separated by a distance of 50 microns. The drive shaft is provided with two discs, one of which produces a pulse at every revolution and transmits it to a decatron counting tube system. On the completion of 100 oscillations, during a 5-mm. travel, a pulse from the decatron reverses the motor and the stage is returned to its starting

point. During the return movement, scanning continues, but the path is staggered in relation to that followed during the forward movement, and the total length scanned is 2,000 mm. The second disc is slotted to act as a shutter for a light cell which operates a gate to prevent counting, and the disc is so positioned as to cut off the light from the photo-cell when the stage approaches its reversal points. At these points, the scanning track is U-shaped and recording is not desired because of speed variations. Thus, counting takes place only for the straight portions of the scanning track.

Satisfactory results of counting and sizing analyses depend on the preparation of suitable slides for mounting on the scanning stage, and Diadust, Ltd., have developed a technique which ensures even distribution of diamond particles over the scanning area. A trained laboratory worker applies a mixture of a known quantity of diamond powder dispersed in a mixture of Canada balsam and xylene to a standard microscope slide and cover glass. Pressure is applied to the cover glass to expel most of the mixture and the remainder is allowed to harden. A very thin film is thus obtained with the diamond particles to be counted and sized in one plane.

When a count is taken of particles in a sample of diamond powder the equipment is set to reject information relating to all particles smaller than the minimum size to be recorded. Three scanning runs are made, the slit width w and the discriminator setting p being varied for each run. The counts obtained during the three scanning runs are recorded and substituted for symbols in a simple equation which, when resolved, gives the number of particles contained in an area of 1 sq. mm. It should be noted that a number count cannot be obtained from a single scan with a given slit width.

To obtain a size distribution of particles a further series of scans is made with different values of p and w arranged in a $\sqrt{2}$ progression and the numbers obtained for each setting are recorded on a programme sheet. A linearity check may be made by plotting the results graphically from which any errors due to faulty settings of the controls may be observed.

EXPORTS OF MACHINERY, other than electric, during the first quarter of this year reached a total value of £213,003,868, as compared with £183,866,664 during the same period of 1960. Principal markets for the first quarter of 1961 were, Australia (£15,865,342), U.S.A. (£12,952,465), Canada (£12,170,296) and India (£11,490,363).

Churchill Grinders at the British Trade Fair, Moscow

EXHIBITS OF THE CHURCHILL MACHINE TOOL Co., LTD., Broadheath, Manchester, at the British Trade Fair, held recently in Moscow, included their latest type BW cylindrical grinder, which was fitted with an electro-pneumatic sizing unit, and automatic work loading and unloading equipment of new design, as shown in Fig. 1.

The type BW machine, which was described in MACHINERY, 96/1487—22/6/60, has a maximum swing capacity of 10 in. diameter, and work up to 20, 36 or 60 in. can be held between the centres, depending upon the length of the bed. Designed for operation on a fully automatic cycle for plunge grinding operations only, the machine has a patented diminishing feed system, and there is provision for automatic wheel dressing and compensation after a pre-set number of parts has been ground. Since in-feed—and consequently grinding pressure—is progressively reduced during the working cycle, the work is held to a high degree of accuracy for roundness as well as diameter.

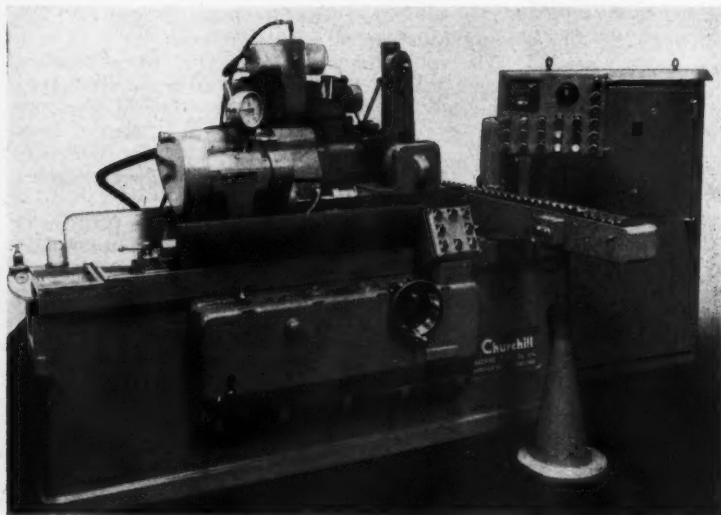


Fig. 1. A Churchill type BW cylindrical grinder, fitted with an electro-pneumatic sizing unit and work loading and unloading equipment of new design, as here shown, was exhibited at the recent British Trade Fair, Moscow

A micro-switch, operated by the loading equipment, initiates the grinding cycle, and the work-head is then started, the coolant is turned on, and the gauging head for the sizing equipment, which is mounted on the table as shown at A in the close-up view Fig. 2, is advanced to bring the caliper of the measuring equipment into engagement with the work.

The machine wheel-head is then advanced towards the work under rapid power traverse. At the end of this travel, grinding commences at a coarse feed rate, which is progressively reduced to a fine rate for finish grinding. When the work has been brought to a predetermined diameter, close to the required size, an electric signal transmitted by the gauging equipment operates a solenoid-operated stop valve in the exhaust line of the hydraulic feed system, to stop the inward traverse of the wheel-head.

The latter unit dwells for sparking out, and when the required work diameter is reached, a second signal is transmitted by the sizing equipment, with the result that the gauging unit and the wheel-head are returned to the starting positions. Finally, the coolant supply is turned off and the work-head is stopped to complete the grinding cycle.

Next, a hydraulically-operated loading arm mounted on the tail-stock, is swung to the left into the horizontal position, as shown at B. During this movement, a pair of jaws at the outer end of the arm is swivelled independently, through 90 deg., and then closed hydraulically to grip the ground component. The entire assembly and the tail-stock barrel is now moved horizontally to the right to bring the component clear of the

work driver on the headstock spindle. When the loading arm has been traversed to the full extent, movement of the tailstock barrel continues independently, to bring the centre clear of the end of the work. The loading arm is now swung to the right through 180 deg., the gripper jaw assembly being simultaneously swivelled independently, so that the component is maintained in the horizontal position. Next, the gripper jaws are opened to discharge the ground component on to one of a number of cradles attached to an indexing, chain-type, conveyor, which is mounted at the end of the bed at right-angles to the machine centre line, as may be seen in Fig. 1.

The conveyor is now indexed to bring a fresh component into line with the gripper jaws, the ground piece being simultaneously moved in a direction towards the rear of the bed. When the jaws have been closed to grip the fresh workpiece, the loading arm is swung through 180 deg. in the opposite direction to bring the part into line with the work-head and tailstock centres. Next, the tailstock barrel is moved to the left, independently for the first part of its travel, to bring the centre into contact with the work, and then with the loading arm assembly, to press the work into engagement with the driver. Finally, the gripper jaws are opened and the loading arm is swung to the right through 90 deg. and then locked, so that it is held in the vertical position while grinding is in progress. The grinding cycle is then started.

The work conveyor and loading arm here described has been designed primarily for use on Churchill grinders which are installed with other machines in a link line. Alternatively, these units may be employed in conjunction with articulated and gravity-type magazines for handling workpieces on machines which are arranged in a group. Since the conveyor is located at the tailstock end of the bed, the operating position is left clear and there is free access for setting up and maintenance work.

If required, the Churchill type BW machine can also be fitted with an indexing work conveyor of the type which was described in MACHINERY, 98/83—11/1/61. With this arrangement, the entire conveyor unit, which is mounted at the front of the bed, is pivoted towards the work axis at the end of the grinding cycle. As a result, a pair of spring clips attached to the conveyor is passed

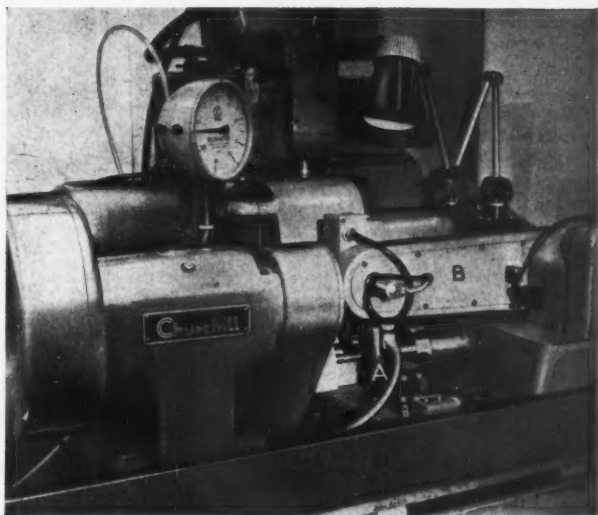


Fig. 2. In this close-up view of the Churchill type BW cylindrical grinder, the gauging head of the sizing equipment is shown at A, and the hydraulically-operated loading arm at B

over the ground workpiece. When the part has been released from the work-head and tailstock centres, it is moved clear, and a fresh part is brought to the grinding position, by the indexing motion of the conveyor. When the fresh component is held by the centres, the conveyor is swivelled to its original position, and grinding can then proceed.

TYPE HBM AUTOMATIC INTERNAL AND FACE GRINDING MACHINE

The latest type HBM automatic internal grinder, which was exhibited, incorporates a recently-introduced face grinding head and a new work loading unit, as shown in Fig. 3. Arranged for operation on a single automatic cycle, or a double cycle with intermediate truing, the machine will swing a maximum diameter of 12 in. inside the work guard and 19 in. over the table, and enables bores up to 8 in. diameter to be ground for depths up to 5½ in. It can be set for plunge cutting when short bores are to be ground. If required, the solenoid-operated mechanism which provides for automatic working can be disengaged when parts are to be handled singly. Plug gauge sizing equipment can be provided, and there is a "feed accelerator" arrangement whereby a rapid approach is maintained until the wheel starts to

cut. Consequently, the cycle time is reduced if the grinding allowance on the work is less than that for which the feed mechanism has been set. Details of the basic type HBM internal grinder were given in MACHINERY, 88/1132—22/6/56.

The face grinding head can be brought into operation as part of the automatic working cycle, and may be adjusted vertically for positioning the wheel in relation to the work. In addition to operations on the end faces of workpieces, the head may be employed for grinding the ends of blind bores.

When a component has been loaded into the chuck on the work-head, an upper slide, which carries the face grinding spindle, is advanced transversely to bring the wheel to a position above the work axis. The work-head is now started, and the face grinding head is advanced towards the work under rapid power traverse. When the wheel has been brought close to the end face of the work, the rapid power traverse motion is stopped and feed, which is progressively diminished as grinding proceeds, is applied to the head. At the end of the face grinding operation, the head is returned to its starting position, and the wheel is then automatically dressed. During the dressing operation, a relief is formed on the wheel to provide a cutting edge at the periphery.

Next, the head is automatically adjusted to compensate for the reduction in the width of the wheel which has resulted from dressing. A switch is now operated to energize a solenoid which causes the table to be rapidly traversed in preparation for the internal grinding part of the cycle.

Workpieces to be ground are passed to the loading unit on the machine by way of a chute or a magazine, at the lower end of which there is a gate. Incorporated in the loading unit is a carriage, which is provided with a swing arm, and can slide in the horizontal direction on guide bars supported at their ends by brackets fixed to the bed. At the beginning of the loading cycle, the carriage is traversed in a direction towards the work-head, so that an arbor at the outer end of the swing arm is passed into the bore of the work-piece held in the gate. The carriage is now moved in the opposite direction, and the arm is then swung downwards. Next, the carriage is again moved in a direction towards the work-head to bring the component into contact with end stops in the chuck. When the chuck jaws have been closed, the swing arm and the carriage, which are operated by compressed air, are returned to their original positions, and the grinding cycle is started. After the chuck has been opened at the end of the grinding cycle, the component is ejected by a built-in spring-loaded plunger, and is discharged from the machine by way of a chute.

TYPE EC CENTRELESS GRINDER

In Fig. 4 is shown the Churchill type EC centreless grinder, fitted with an automatic work loading unit and automatic size control equipment, as demonstrated at the Fair, for grinding needle rollers. With this set-up, to which reference was made in MACHINERY, 95/464—9/9/59, it is stated that $\frac{7}{8}$ -in. diameter by 1-in. diameter rollers can be ground to a tolerance of 0.0002 in., and a surface finish of 2 micro-inches, at the rate of 12,000 to 15,000 per hour, and two or three machines may be tended by one operator.

Rollers to be ground are passed through an opening in the cover of the loading unit at the front of the bed, to be discharged on to a disc which is driven by belts and gears from a motor. The rollers are then moved outwards by centrifugal action into contact with the rim of a sur-

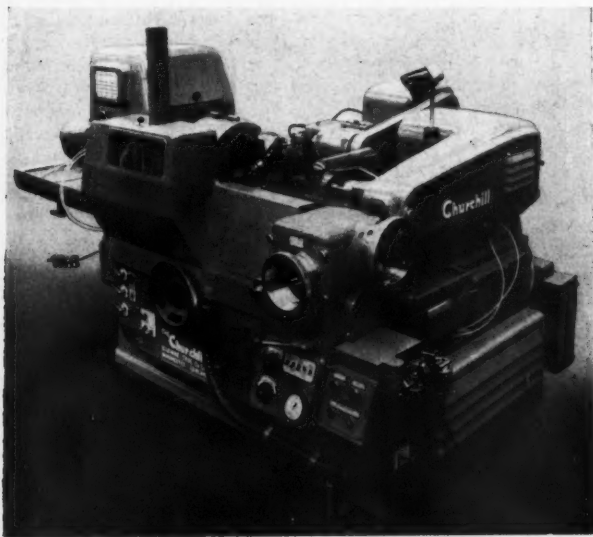


Fig. 3. Churchill type HBM internal grinder fitted with a recently-developed automatic face grinding head, and a new work loading unit

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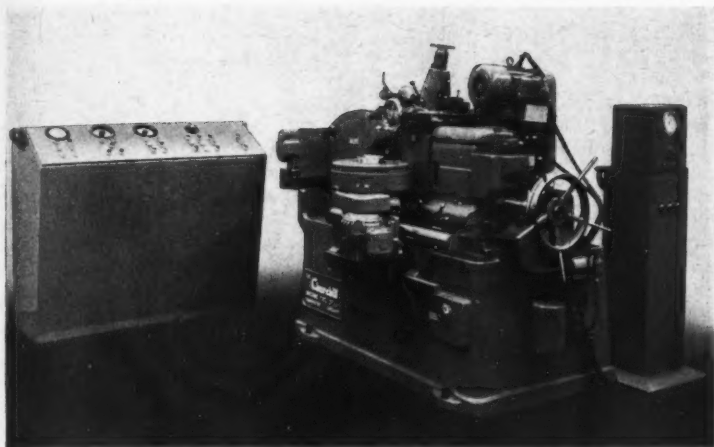


Fig. 4. The Churchill type EC centreless grinding machine is here shown equipped with a rotary-type work loading unit and compressed air automatic size control equipment, and is set up for grinding needle rollers

rounding drum, and are passed, singly, through a nozzle on to the work plate, to be fed between the grinding and control wheels.

As each component leaves the grinding throat, it passes through a gauging unit, and the diameter is sensed by compressed air, which is delivered through nozzles at intervals, under the control of a timer. The diameter of the work in relation to the nominal size is shown by an indicator unit at

the rear of the machine, and as the grinding wheel wears, the increase in diameter causes a signal to be transmitted to a feed compensating motor by way of the control unit. The output shaft of this motor is then turned through one revolution, and motion is transmitted to the feed screw by crank disc and link, ratchet mechanism, and worm gearing. The amount of feed thus applied can be varied by adjusting the throw of the link on the crank disc. In this way, correction is applied to the control-wheel slide before the work diameter exceeds the upper limit.

If the work diameter should fall below the lower limit, a visual or aural signal is energized, and the feeding of workpieces is stopped. The feed screw engages with a nut of the ball-circulating type, so that the risk of stick-slip is avoided when very small adjustments are being made, and the control-wheel slide is mounted on roller guideways which ensure sensitive movements.

Personal

MR. R. F. HOCKIN, A.C.W.A., A.M.I.Mech.E., has resigned from the board of Burtonwood Engineering Co., Ltd., in order to devote more time to his other interests.

MR. NORMAN READMAN, managing director of the Consolidated Pneumatic Tool Co., Ltd., of 232 Dawes Road, London, S.W.6, has been elected president of the Chicago Pneumatic Tool Company, New York, U.S.A.

MR. H. C. FOX, M.I.E.E., has retired from George Ellison, Ltd., Perry Barr, Birmingham, 22B, after 47 years' service. In 1926 he was made responsible for the design and development of high voltage switchgear, and from 1937 onwards he planned and laid out the Ellison ASTA authorized testing station.

The following new appointments have been announced:—

MR. F. T. DAVIES, A.C.I.S., A.M.I.W.M., as financial director and secretary of Dialoy, Ltd., Colchester Factory Estate, Cardiff.

SIR EDWARD PLAYFAIR, K.C.B., as chairman of International Computers and Tabulators, Ltd., Gloucester

House, 149 Park Lane, London, W.1, with effect from August 1 next, when he will be released from the post of Permanent Secretary to the Ministry of Defence.

MR. D. MAJOR, B.A., B.Sc., as assistant chief engineer of the X-Ray Department of the Instrumentation Division, Associated Electrical Industries, Ltd., Crown House, Aldwych, London, W.C.2.

MR. A. H. H. YOUNG, B.Sc. (Eng.), A.M.I.E.E., as general manager of the Derby Works of Crompton Parkinson, Ltd., Crompton House, London, W.C.2. He will be responsible to Mr. R. F. D. Milner.

MR. A. H. CAMPBELL, M.A., M.I.E.E., a director of the company since 1951, and general manager since 1954, as joint managing director, with Mr. G. A. Whipple, M.A., M.I.E.E., F.Inst.P., of Hilger & Watts, Ltd., 98 St. Pancras Way, Camden Road, London, N.W.1.

MR. G. A. JONES, formerly South Wales regional manager for Grant, Lyon & Co., Ltd., Scunthorpe, Lincolnshire, a member firm of the Chamberlain Group, as technical representative for the company for the whole of England and Wales with the exception of Durham and Northumberland.

Gefra Twist Drill Milling Machine

FUNDITOR, LTD., 3 WOODBRIDGE STREET, LONDON, E.C.1, have recently been appointed sole agents in this country for the range of twist drill milling machines built by N.V. Maschinefabriek Gefra, The Hague, Holland.

Shown in Fig. 1, the Gefra type VM-1 machine, which was demonstrated recently at the Funditor works at Wembley, Middlesex, is designed to mill two flutes and clearances at the periphery, on twist drills from $\frac{1}{8}$ to $\frac{1}{2}$ in. diameter, on a fully-automatic continuous cycle. The maximum milling length obtainable is $4\frac{1}{2}$ in. Driven by belts from separate electric motors, the cutter heads are grouped at the nose end of the hollow work spindle as shown in the close-up view Fig. 2, and since milling is carried out simultaneously on both flutes and clearances on the blank, a balanced cutting action is obtained. The cutter heads for milling the peripheral clearance are mounted on a swivel carrier, and the entire assembly can be turned on a horizontal axis for varying the amount of land produced on the drill. The other heads can be swivelled in the horizontal plane, and are normally set to the helix angle of the flutes, to be milled in the blank. If required, the setting can be varied, by a maximum of about 3 deg., for milling flutes which are slightly wider than the cutters. Climb milling is employed, and the special cutters are form-relieved.

A collet is incorporated in the work spindle for holding the blank while milling is in progress, and between the spindle housing and the swivel carrier for the cutter heads for milling the peripheral clearances, there is a split bush, which can be adjusted by threaded cone-shaped end pieces, so that the bore makes contact with the blank to provide support. Over the central portion, the bore is enlarged, and there are radial

slots in the bush through which the milling cutters pass.

When milling is in progress, the work spindle is simultaneously turned and traversed in an axial direction, so that the blank is moved past the cutters, by the action of a hollow cylindrical lead bar at the rear end, which is driven from a barrel pinion, through a large-diameter gear, as may be seen in the close-up view Fig. 3. A total of seven interchangeable lead bars is provided with the machine for milling flutes with helix angles from 15 to 35 deg. If the helix angle of the flutes to be milled in the blank differs by a small amount from that of the spiral groove in the lead bar, a second groove may be machined in the bar.

Drive to the barrel pinion for imparting feed to the drill blank, is taken from a motor housed in the base, through a belt and expanding pulleys, and thence through a speed reduction unit. With this arrangement, the feed may be varied steplessly to suit the diameter of the blank to be milled. The cutter spindles of the flute-milling heads are mounted in eccentric bearing housings, which are turned while milling is in progress, by a pair of arms, so that a web of progressively increasing

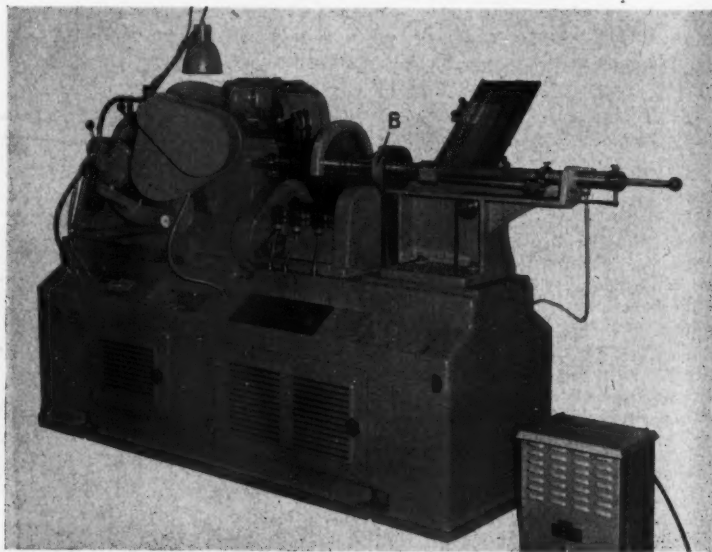


Fig. 1. Dutch-built Gefra type VM-1 fully-automatic twist drill milling machine

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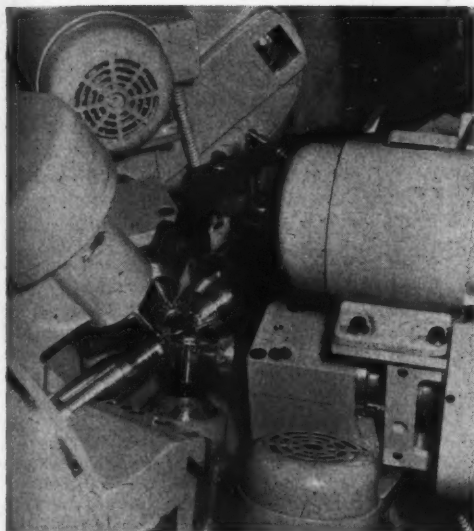


Fig. 2. Close-up view of the cutter heads for milling, simultaneously, the flutes and clearances at the periphery on a twist drill blank on the Gefra type VM-1 machine

thickness is obtained. The outer ends of the arms are held downwards by springs in contact with a block which is supported by the adjustable inclined bar A. A slide, which carries the bar A and the block, is guided in ways on the top face of the housing for the work spindle, and is attached at its right-hand end to a guard partly surrounding the large-diameter driving gear for the lead bar.

With this arrangement, the slide and the bar A move with the lead bar and the work spindle, independently of the block, to tilt the arms for swivelling the spindle bearing housings. At a point near the end of the milling stroke, an abutment plate at the upper end of the bar A makes contact with the block, and the latter then moves with the slide and the work spindle. The outer ends of the arms now ride up a steeply-inclined face on the block with the result that the cutters are moved away from each other fairly rapidly to give the required "run out" form at the shank end of the flutes on the twist drill.

When the work spindle has been brought to the end of the milling stroke, one of the arms is held by a spring-loaded plunger carried on a bracket on top of the block. At the same time, a stop attached to the guard for the large-diameter driving gear, which is now at the extreme left-hand end of its travel, operates a micro-switch to de-energize an electro-magnetic clutch in the feed drive. The switch also stops the cutters for milling the peripheral clearances, and starts a separate motor, housed in the base, which drives the barrel pinion through V-belts to impart rapid power traverse to the work spindle and lead bar assembly. For part of the rapid return travel of this assembly, the slide and the bar A move independently of the block, which remains connected to one of the arms by the spring-loaded plunger as previously explained. Another striker plate, at the lower end of the bar A, then makes contact with the block, with the result that the plunger is disengaged, and the block is caused to move with the slide. During this movement, the arms ride down the inclined face on the block, and the flute-milling cutters are re-set in readiness for the next working cycle of the machine.

During the last part of the return travel, dog-clutch teeth on the end face of a draw tube, which passes through the bores of the lead bar

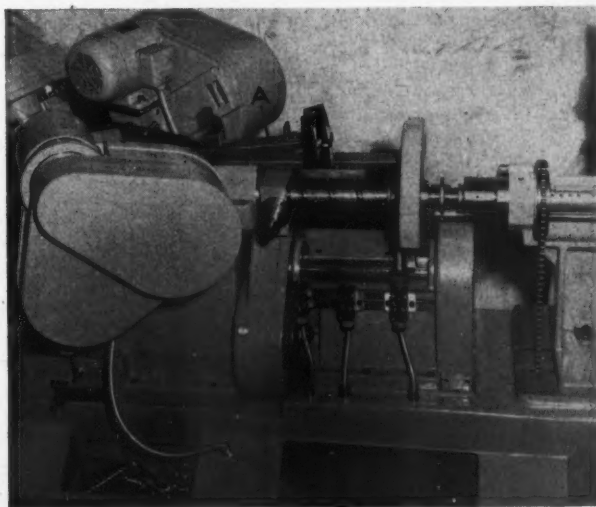


Fig. 3. In this close-up view may be seen the barrel pinion and the driving gear for the work spindle and lead bar assembly. The inclined bar A controls the amount of swivelling movement imparted to the bearing housings for the flute-milling spindles

and the work spindle, and extends at the right-hand side of the driving gear, engage with mating teeth within the bore of the collet-operating mechanism *B* (Fig. 1), carried at the left-hand end of the loading tube for the drill blanks. Since the lead bar continues to rotate, the draw tube is turned to open the collet to release the completed drill. Also during the return movement, a pawl carried on a pusher rod, which is connected to a shaft extension at the right-hand side of the driving gear, moves a plunger within the bore of the loading tube, in an axial direction to the right. When the collet has been opened, the pawl is swung outwards, clear of the end of the plunger, by the bevelled end of a ring attached to the loading tube, and the plunger is then moved to the left by a roller chain connected to a weight housed in the bed.

In this way, the leading drill blank of a stack, which is carried on an adjustable inclined chute, is pushed into guide bushes within the draw tube. A number of blanks is accommodated within the guide bushes, and during the movement of the plunger, the leading piece is pushed through the collet, and causes the completed twist drill to be ejected into a chute, down which it is discharged into a container at the front of the bed.

When the lead bar and work spindle assembly has been brought to its extreme right-hand position, the stop on the guard for the driving gear operates a microswitch to reverse the rapid traverse motor. Since the mating dog clutch teeth on the draw tube and the unit *B* continue to be held in engagement during the first part of the rapid traverse motion to the left, the collet is closed to grip the fresh blank. The torque applied to the draw tube when the collet is being closed is controlled by another weight, also housed in the bed, which is connected to the unit *B* by a roller chain, and with this arrangement a pre-set gripping pressure is obtained on the blank. At a pre-set point in the travel of the lead bar and work spindle assembly to the left, the stop operates a third micro-switch, with the result that the rapid traverse motor is stopped, and the electro-magnetic clutch is energized to start the feed at the beginning of the milling cycle.

During the demonstration, 3-in. long flutes and peripheral clearances were milled in a high-speed steel blank for a $\frac{1}{8}$ -in. diameter twist drill in a cycle time of 47 sec. It is stated that the cycle time for milling a blank for a $\frac{1}{4}$ -in. diameter drill is 68 sec.

A type F 40 twist drill milling machine, designed for operation on a semi-automatic cycle, with hand loading of blanks, is being developed, which is intended to supersede the type HM-4

and type HM-5 machines previously built by the company. These machines will handle twist drills from $\frac{1}{8}$ to $1\frac{1}{2}$ and from $\frac{1}{8}$ to $1\frac{1}{4}$ in. diameter, with flutes of 30 deg. helix angle. The largest machine in the Gefra range—the type HM-6—has a capacity for milling blanks for twist drills from $1\frac{1}{4}$ to $2\frac{3}{4}$ in. diameter, again with flutes of 30 deg. helix angle.

Trade Publications

AIR AUTOMATION, 26 Sharrocks Street, Wolverhampton, Staffs.—Well-produced catalogue describing and illustrating the firm's ranges of diaphragm/poppet valves, piston valves, air line accessories and fittings, air hose, air cylinders from $\frac{1}{8}$ - to 3-in. bore, air vices, and core box air vents.

ELECTROTHERMAL ENGINEERING, LTD., 270 Neville Road, London, E.7. Leaflet describing the patented flexible electric surface heater which can be built up from standard units to any required size, and provides for heating to controlled temperatures up to 1,000 deg. C., or 1,500 deg. C. under inert atmosphere conditions.

CAMREX PAINTS, LTD., P.O. Box No. 34, Camrex House, Hudson Road, Sunderland. Illustrated 56-page booklet devoted to Camrex industrial maintenance coatings, which include corrosion resistant paints, and enamels suitable for machinery. Varnishes and special coatings are also listed.

LANDIS MACHINE CO., Waynesboro, Pa., U.S.A., (Landis Machine-Maiden, Ltd., Hyde, Cheshire). Ten-page information booklet entitled "Design ABC's of Rolled Worm Threads," which gives, with illustrations, some general rules on work design and rolling practice on Lan-Nu-Rol, Lan-Hy-Rol, and Hy-Duty cylindrical thread and form rolling machines.

IMPERIAL CHEMICAL INDUSTRIES, LTD., Fibres Division, Hookstone Road, Harrogate, Yorks. Well-illustrated booklet entitled "Terylene in Industry." Properties are first discussed, and sections are then devoted, for example, to overalls and protective clothing, conveyor belting reinforcement, coated fabrics, electrical applications, filter fabrics, industrial hose reinforcement, and V-belts.

JOHN HARPER & CO., LTD., Albion Works, Willenhall, Staffs. Informative publication (S.G.2) concerned with Harper S.G. iron. The characteristics of this material are first discussed, and sections are then devoted to tensile, high temperature, and electrical properties; recommended heat treatments; machining; design data; and applications.

JOHNSON, MATTHEY & CO., LTD. (controlling Mallory Metallurgical Products, Ltd.), 73-83 Hatton Garden, E.C.1. Leaflet 7200/3 gives particulars of the Mallory range of resistance welding electrode materials. Properties of these materials are tabulated, and sections are devoted to spot, seam, projection, and butt and flash welding; hot riveting; resistance brazing and soldering; and electroforming. In another section concerned with availability, particulars are given of a wider range of seam-welding wheel blanks in Mallory 3 which can now be supplied from stock.

Stanley Howard Machine Tool Demonstration

Stanley Howard, Ltd., 73 Devon Street, Birmingham, 7, recently staged demonstrations of some examples from the range of machine tools for which they are the selling agents.

Built by the German firm of Schwäbische Hüttenwerke, the type UF 2 Omniplex toolroom milling machine which was shown (see MACHINERY, 98/1087—10/5/61) can be supplied with a 42½- or 50½-in. long by 15½-in. wide table. The table can be swivelled in each direction in the plane of the working surface, also tilted to the left or right and towards or away from the column through maximum angles of 30 deg. Longitudinal travel of 14½ in., and cross movement of 11½ in. are provided for the table on the saddle. In addition, the table saddle can be traversed through a maximum distance of 25½ in. in the longitudinal direction, and the knee assembly through 17½ in. vertically, by hand or power. A maximum distance of 18½ in. is obtainable between the top surface of the table, and the centre line of the horizontal cutter spindle built into the ram-type head, which has a cross travel of 17½ in. on guideways on top of the column. The 18 spindle speeds obtainable range from 35 to 2,240 r.p.m.,

the drive being taken from a 4.7-h.p. motor. Nine feeds from ½ in. per min., also rapid power traverse, are provided by a 1½-h.p. motor. On top of the cutter head there is a turret fitted with a vertical-spindle milling head, a slotting unit, and an overarm for supporting a cutter arbor for horizontal milling, each of which can be readily swung to the working position, as required.

Also of interest was the Goliath heavy-duty centre lathe built by Eugen Weisser & Co., K.G., Heilbronn/Neckar, Germany, which has built-in equipment for automatic high-speed screwcutting. A view of the saddle and headstock of this lathe is given in Fig. 1. It will swing maximum diameters of 17½ in. over the bed-ways and 9½ in. over the cross-slide, and is normally available in any of three different bed lengths, which enable a maximum of 40, 60 and 80 in. to be accommodated between the centres. The bed, which has hardened steel guideways for the saddle and tailstock, is of the sloping type, so that free discharge of swarf from the cutting tool is obtained.

Drive is taken from a 10-h.p. motor, and the 12 spindle speeds range from 31½ to 1,400 r.p.m. Alternatively, a 7½-h.p. motor can be fitted, and the 12 spindle speeds then obtainable range from 22.4 to 1,000 r.p.m. The quick-change feed gearbox provides for cutting 40 different screw threads from 2 to 28 per in., 1 to 14 mm. pitch, and from 8 to 112 d.p., also 23 threads from 0.25 to 3.5 module, without the need for change gears. There are 50 sliding and surfacing feeds, the former ranging from 0.001 to 0.031, and the latter from 0.0006 to 0.018 in. per rev.

Spindle speeds are selected by a lever in conjunction with a direct-reading dial on the headstock, and any feed within the range provided can be brought into use, merely by

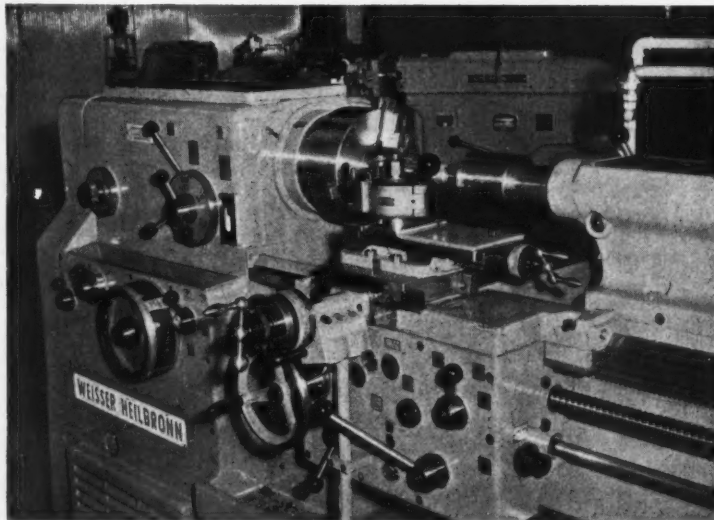


Fig. 1. A close-up view of the Weisser Goliath heavy-duty centre lathe, which incorporates automatic high-speed screwcutting equipment

turning a single drum on the feed gearbox to the required position. The sliding gears within the headstock and feed gearbox, which takes the form of a single-piece casting, are mounted on shafts of tri-lobed cross section, and are lubricated by a built-in pump. A noteworthy feature of the design is that the headstock spindle can be adjusted in the vertical and horizontal planes, to compensate for any misalignment of the work centres due to wear of the bed-ways.

Of the totally-enclosed type, the apron incorporates a sensitive safety clutch which can be disengaged to arrest feed by the action of a stop that is detachably-mounted on the bed-ways, or when a pre-set cutting pressure for turning or facing is applied. The apron gears are lubricated by a built-in pump, and lubricant for the bed-ways and cross-slide guideways is delivered by a lever-operated pump at the rear of the saddle. Push-buttons are built into a housing at the rear of the handwheel for the cross-slide traversing screw, for starting and stopping the main driving motor, which incorporates an electrical braking system.

The automatic equipment enables external and internal screw threads of right- and left-hand to be cut at spindle speeds up to the maximum available on the lathe, although to ensure accurate operation of the reversing mechanism, the saddle feed should not exceed 4 in. per min. An indexing mechanism permits multi-start threads to be cut without the need for setting the headstock spindle for angle by hand. For automatic screwcutting, the half-nuts are maintained in continuous engagement with the leadscrew, and the latter is reversed at the end of the cutting and return strokes by means of a stop on the saddle which engages collars mounted on a shaft at the front of the bed, below the feed shaft. The stop is lowered to the working position by a lever on the saddle, and the collars are adjusted on the shaft to suit the length of the thread to be cut.

Simultaneously with reversing of the leadscrew, the cutting tool is brought towards or away from the work by a quadrant mechanism built into the saddle. This mechanism is operated by a pair of stops mounted on another shaft at the rear of the bed, and serves to impart movement in an axial direction to the telescopic cross-slide traversing screw. These stops have fine adjustment, so that the movement of the cross-slide can be closely controlled in order to prevent the cutting tool from fouling the workpiece bore when it has been brought clear at the end of a cutting stroke on internal threads. The shaft is swivelled by a lever at the right-hand end of the bed when it is required to move the stops to the working position for automatic screwcutting. One of the

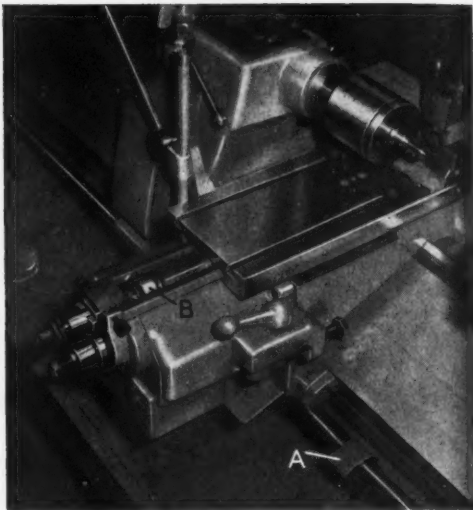


Fig. 2. In this close-up view of the saddle, from the rear, may be seen the built-in mechanism for setting and imparting increments of in-feed to the cross-slide for automatic screwcutting

stops is indicated at A in the close-up view Fig. 2. In this view, a cover plate has been removed from the top face of the saddle, to show the mechanism for setting and imparting increments of in-feed to the saddle.

When the cross-slide is advanced towards the work at the beginning of a screwcutting stroke, the serrated end face of the ring B, attached to the feed-screw, engages a chisel-shaped extension on a sleeve mounted in a bore in the end of the saddle casting. During continued movement of the cross-slide, the sleeve, the ring B and the feed-screw are turned as a single assembly to apply an increment of in-feed by the action between a dog on the saddle and a helical slot machined in the periphery of the sleeve. For the first part of the return movement, when the tool is being brought clear of the work at the end of the screwcutting stroke, the ring B moves with the cross-slide, independently of the sleeve, and the latter is then pushed in an axial direction for re-setting, by a pair of collars mounted on a reduced diameter extension on the traversing screw. The amount of "lost motion" between the collars and the end of the sleeve, and, consequently, the increment of in-feed to be applied to the cross-slide, can be varied by adjusting the collars on the extension. The

(Continued on page 1386)

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NEWS OF THE INDUSTRY

Halifax

WILLIAM ASQUITH, LTD., Highroad Well, inform us that the overall trading position is very satisfactory. Orders from both the home and export markets are in hand for all the machine tools in the company's range, and it is stated that some 20 per cent of the output is destined for various countries overseas. Demand for radial drilling machines in the O.D.I. range, up to 7-ft. radius, is very satisfactory, and there is a steady call for the heavier type machines, from 8-ft. radius upwards. Portable radial machines are also in request, and there is a steady output of E.G.C. type fixed-arm machines for use on structural work. The 3.P.S. precision radial drilling machine, which was shown at Olympia last year, is now in regular demand. It may be noted that export orders for radial drilling machines include a number from Japan.

A large number of orders is in hand for transfer machines for the motor vehicle industry, and an order has recently been received for a special deep-hole drilling machine for export to Rhodesia.

The range of horizontal boring and milling machines up to 8-in. spindle size is also in good demand, and orders for ram type milling and boring machines, which range from 6-in. to 10-in. spindle size, include several for export to India and Japan.

The company will have a number of exhibits at the European Machine Tool Exhibition in Brussels, including a 6-in. ram type milling and boring machine, and two 3.P.S. type radial drilling machines, of 6-ft. and 8-ft. radius.

FREDERICK TOWN & SONS, LTD., Gibbet Street, are very busy with the production of their range of standard elevating arm radial drilling machines up to 8-ft. radius. An 8-ft. radius machine with a traversing bed was recently ordered, also a number of 8-ft. machines for the Admiralty, and we are informed that a steady flow of orders is being received for vertical drilling machines.

KITCHEN & WADE, LTD., Arundel Street, are fully occupied with the production of their range of machine tools, a good proportion of the output being destined for export. All sizes of standard radial drilling machines are in good demand, and there is a regular call for structural type machines.

Special machines recently ordered have included unit head types, of both vertical and horizontal designs, equipped with two, three, and four heads, and numerous enquiries are being received for special boring, drilling, and tapping machines. An order has recently been booked for a hydraulically operated multi-spindle drilling machine for use in a pipe works.

GRAHAM & NORMANTON, LTD., Dunkirk Mills, Dunkirk Lane, inform us that there is a heavy demand for standard type centre lathes of all sizes in their range, and a steady call for shaping machines. A good volume of orders and enquiries is being received for special machine tools, and keyseating and slot drilling machines are in regular request. Recent orders received have covered standard crank shaping machines up to 28-in. stroke; standard centre lathes of various bed lengths; a number of keyseating machines, including a special No. 8 size with spindle speeds up to 910 r.p.m. and a capacity for keyways up to 2-in. wide by 54 in. long; and a special lathe having a centre height of 33 in. and a 35-ft. long bed.

Work in progress includes standard lathes of 9-in., 13-in., and 17-in. centre height; a special 13-in. centre lathe equipped with a hexagon turret; and two special 17-in., extra-heavy-duty, centre lathes, with 24-ft. long beds of the raised vee type, equipped with two saddles, each with a front and a rear tool post. Each of these lathes has steplessly variable spindle speeds from 5 to 320 r.p.m., drive being taken from a 40-h.p. d.c. motor, controlled by a magnetic amplifier set. We hope to publish further details at a later date.

A. KITCHEN-D. WALKER, LTD., Hexagon Works, Pellon Lane, are busy with the production of their type E.3. (3-in. capacity) and type E.2. (2-in. capacity), elevating arm, radial drilling machines up to 6-ft. radius, and a variety of unit heads for boring, drilling, tapping, and milling. Work in progress includes a type E.3. machine with a right-angle base plate and a swivelling type table. We are informed that orders are being maintained at a satisfactory level, and include many from export markets, particularly Western Germany and the U.S.A.

The company has a development programme which will provide for additions to their current range of machine tools, and we may note that two horizontal boring and facing machines were recently built, which we hope to describe in a later issue.

A type E.3. radial drilling machine was shown at the ASTME Tool Exposition held recently in New York.

R. SUTCLIFFE.

Johansson 50th Anniversary

This year Aktiebolaget C. E. Johansson, Eskilstuna, Sweden, who enjoy a world-wide reputation, celebrate the 50th anniversary of the founding of the company by Carl Edvard Johansson. In connection with this landmark in the history of the firm a well-produced and informative book of 76 pages has been issued.

Following an introductory section by Mr. Rudolf Domellöf, the managing director, there is a list of important dates in connection with the development of the company and its products. Other articles, all of which contain valuable information, interestingly presented, appear under the titles: From Pharaoh's Cubit to Krypton's Red-orange Light; Of Men and Measure; and Measuring Methods Rationalized. Of particular significance to metrologists is an article by Mr. Bert Edénholm on "Break-throughs in Measuring Techniques." Sections of this article are concerned with the significance of reference gauges; fixed gauges; measuring instruments based on mechanical, optical, and electronic principles; pneumatic measuring instruments; and form and surface finish measurement.

There are numerous half-tone and line illustrations and several pages are devoted to high quality illustrations in full colour.

The Significance of Missile and Space Vehicle Production

(Continued from page 1331)

undertaken in response to the demands of the aircraft industry and might otherwise have been delayed for many years.

It is equally certain that many of the lessons that are now being learned by the research establishments and factories concerned with the various aspects of missile and space vehicle design and fabrication will be turned to account in quite different directions. There will be a wider choice of materials to withstand exacting conditions and tried methods of machining or manipulating them. Standards of machine tool accuracy will be im-

proved, and there will be better facilities for non-destructive testing and other forms of inspection. These benefits, moreover, which will lead to improvements in many kinds of products, will not be confined to those countries where such great efforts are now being made, but will be made widely available.

Stanley Howard Machine Tool Demonstration

(Continued from page 1384)

collars can be set to give increments of in-feed up to 0.008 in., and for fine adjustment, the sleeve is turned within the bore in the end of the saddle by a pair of knurled screws.

The amount of cross-slide movement required for cutting the threads for the full depth can be pre-set by means of the micrometer drum on the handwheel at the front of the saddle, and a plunger within the handwheel is then extended radially. When the last cut has been applied, this plunger operates a second plunger, mounted parallel with the cross-slide screw, which, in turn, actuates the push-button switches to stop the lathe.

Industrial Notes

PRODUCTION OF IRON CASTINGS.—The Iron and Steel Board state that the production of iron castings during the first quarter of this year was 1,026,130 tons, as compared with 1,032,860 tons for the corresponding period of last year.

COCKBURNS, LTD., Cardonald, Glasgow, S.W.2, have recently been appointed selling agents in the United Kingdom for the range of pressure gauges, thermometers and special control instruments manufactured by the E.N.F.M. Company of Schiedam, Holland.

IMPREGNATED DIAMOND PRODUCTS, LTD., Tuffley Crescent, Gloucester. This company's No. 2 factory and office block, which has recently been completed, will be devoted to the production of Sparcatron spark machining equipment to meet an increasing demand. It will also enable more space to be allocated for the manufacture of diamond impregnated products.

TRUFORM GAUGE CO., LTD., Woodward Road, Walsall, Staffs., inform us that they have recently been appointed sole selling and servicing agents in the United Kingdom for the Vetcoa thread milling equipment which is made by the Vernon Tool Co., Arizona, U.S.A. This equipment is designed as a self-contained attachment for fitting to vertical milling machines, and is available in hand-operated and fully-automatic versions.

THE BRITISH OXYGEN CO., LTD., report that a second Eagle computer-controlled cutting machine has successfully completed acceptance trials at their Edmonton works. It will now be dismantled for transport to the Barrow shipyard of Vickers-Armstrongs (Shipbuilders), Ltd., for

commissioning trials. The first machine of this type is now installed at the Wallsend-on-Tyne shipyard of Swan, Hunter & Wigham Richardson, Ltd. These machines are equipped with Ferranti magnetic tape control systems.

THE ENGLISH ELECTRIC CO., LTD., English Electric House, Strand, London, W.C.2, have received an order, valued at about £1,500,000, for the first switchgear for the new 400,000-volt "supergrid." It will be installed at the West Burton, Notts., power station.

P.M.T. (MACHINE TOOLS), LTD., Oozells Street, Birmingham, 1, have recently been appointed sole distributors in this country for S.A.I.M.P. of Italy, makers of precision lathes and milling machines. A comprehensive stock of lathes with capacities from 7 by 30 in. up to 16 by 240 in., also vertical, universal, and turret type milling machines, can be seen under power at the company's Birmingham showrooms. A technical representative has been specially appointed to cover this range of machines.

F. J. EDWARDS, LTD., 359-361 Euston Road, London, N.W.1, now represent, in the United Kingdom, Lefebvre Vaneste & Co., Gullegem-Courtrai, Belgium, for single-action, double-action, and triple-action, double-sided, hydraulic, deep drawing presses, a bulldozer, and open-fronted hydraulic drawing presses. Machines in the standard range have capacities up to 500 tons. In addition the arrangement covers L.V.D. hydraulic press brakes up to 320 tons by 12-ft. length capacity, and guillotines up to 8-in. by 12-ft. capacity.

Scrap Metals

MIDLANDS.—Disposal of many grades of scrap is 'daily becoming more difficult due to suspensions and allocations imposed by consumers. Steelworks scrap of Grades 1 and 2 can be delivered locally, but outlets are needed for the 0-04 sulphur and phosphorus scrap in steelworks sizes. Hydraulically compressed bales to No. 4 specification are disposed of readily, but No. 5 bales cannot be placed at present.

Light iron scrap is wanted in loose form but works are insisting that motor body scrap is properly cleaned and does not include copper wiring, alloy handles or any wooden attachments.

Chipped and bushy turnings are still difficult to place and prices as well as allocations are being reduced every week by one blast furnace or another. It seems inevitable that tenders for works' outputs of turnings for the six months beginning July 1 will show reductions in price.

Cast iron scrap trading is quite bright, and all grades can be placed at one foundry or another in this area. The demand for clean cylinder blocks has resulted in good prices being paid for complete engines for cleaning and stripping.

The demand for nickel bearing steels remains firm and straight nickel as well as nickel chromium scrap from local factories is cleared for consumers in the Sheffield area. Stainless steels are also wanted, prices varying according to quality.

With holidays drawing nearer it is expected that disposal of many grades will become even more difficult and merchants will have to reduce prices where scrap must be taken into stock.

MACHINERY'S ENQUIRY BUREAU

For many years MACHINERY has provided an enquiry service not only for subscribers and advertisers but for all engineers in need of such information as the names of makers—or their agents—of machines or equipment for performing particular operations, suppliers of various classes of material, firms with facilities for undertaking certain types of work, owners of trade names, and agents for foreign machine builders. If you have such a problem write (MACHINERY, Enquiry Bureau, Clifton House, 83-117 Euston Road, London, N.W.1) or telephone (Euston 8441, 2 lines). This service is, of course, entirely free.

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Machine Tool Share Market

After displaying dullness, with a generally lower trend, for the greater part of the period under review, stock markets tended to rally, and finished on a steady note, with improvements in most sections.

The gilt-edged market, however, remained subdued, and quotations for British Funds gradually gave way owing to lack of buying interest.

Commercial and industrial share markets were moderately active, and after some sharp setbacks, the general tone steadily strengthened, and by the close a number of gains had been recorded and a few good features were in evidence as a result of favourable company statements.

Among machine tool issues, Arnott & Harrison advanced 1s. 3d. to 17s. 3d. and British Oxygen, 6d. to 24s. On the other hand, Edgar Allen lost 1s. at 43s. 6d.; Birmingham Small Arms, 4s. at 27s.; Chas. Churchill, 1½d. at 9s. 6d.; Geo. Cohen, 6d. at 14s.; Coventry Gauge & Tool, 9d. at 32s. 10½d.; Craven Bros. (Manchester), 6d. at 10s. 1½d.; Greenwood & Batley, 6d. at 26s. 6d.; Alfred Herbert, 5s. at 72s. 6d.; Newall Engineering, 1s. 6d. at 10s. 3d.; W. E. Norton (Holdings), 1s. 3d. at 10s.; Samuel Osborn, 1s. 9d. at 56s. 3d.; Ambrose Shardlow, 2s. 6d. at 66s. 10½d.; John Shaw & Sons (Wolverhampton), 7½d. at 19s. 4½d.; Sheffield Twist Drill, 6d. at 19s. 6d.; W. E. Sykes "B",

1s. 3d. at 31s. 3d.; Tap & Die Corporation, 9d. at 18s. 3d.; and Thos. W. Ward, 1s. 6d. at 82s.

CHARLES CHURCHILL & CO., LTD. Final dividend 11½ per cent, making, with the interim, a total distribution of 20 per cent for the year to March 31. This was an increase of 2 per cent on the total for the previous year.

H. W. KEARNS & CO., LTD. Int. div. 5 per cent (same).

NEWALL ENGINEERING CO., LTD. Dividend 20 per cent for the year to March 31, on increased capital, against the forecast of a maintained 17½ per cent payment.

New Companies Registered*

BENTLEY OF REDDITCH LTD., 89a Birchfield Road, Redditch, Worcs. Registered May 18, 1961. To take over business carried on as "Bentley (Redditch) Engineering Company" at Redditch, etc. Nom. cap.: £6,000 in £1 shares. Director: G. Shephard.

B. & M. TOOLMAKING CO. LTD., 14 Christchurch Road, Bournemouth. Registered May 17, 1961. Nom. cap.: £2,000 in £1 shares. Directors: A. Barrett and Thos. A. Mackenzie.

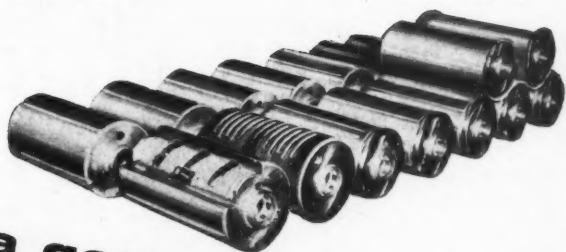
* From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

COMPANY		Denom.	Middle Price	COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	2/6	Herbert (Alfred), Ltd.	Ord.	£1	72/6
Allen (Edgar) & Co., Ltd.	Ord.	£1	43/6	Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	22/6xd
	5% Prf.	£1	13/6*	" " "	"B" Ord.	5/-	20/6xd
Arnott & Harrison, Ltd.	Ord.	4/-	17/3	Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	30/-
Aquith Machine Tool Corp., Ltd.	Ord.	5/-	11/6		7% Cum. Prf.	5/-	4/9xd
" " "	6% Cum. Prf.	£1	16/6xd	Kearney & Trecker-C.V.A., Ltd.	5% Red.	£1	11/-
Birmingham Small Arms Co., Ltd.	Ord.	10/-	27/-xd		Cum. Prf.		
" " "	5% Cum.	£1	14/6	Kearns (H. W.) & Co., Ltd.	Prefd. Ord.	£1	13/9
" " "	6% Cum.	£1	17/-	Kerry's (Gt. Britain), Ltd.	Ord.	5/-	25/-
" " "	4% 1st Mort.	Stk.	90½		Ord.	5/-	10/7½
British Oxygen Co., Ltd.	Dab.			Macready's Metal Co., Ltd.	Ord.	5/-	17/-xd
" " "	Ord.	5/-	24/-	Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
" " "	6% Cum. Prf.	£1	20/6	Massey (B. & S.), Ltd.	Ord.	5/-	12/-
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	10/3	Newall Engineering Co., Ltd.	Ord.	2/-	10/3
Broom & Wade, Ltd.	Ord.	5/-	24/9	Newman Industries, Ltd.	Ord.	2/-	6/3
" " "	6% Cum. Prf.	£1	16/6		6% Prf. Ord.	5/-	5/-
Brown (David) Corporation, Ltd.	5% Cum. Prf.	£1	16/-xd	Noble & Lund, Ltd.	Ord.	2/-	6/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-	Norton, W. E. (Holdings), Ltd.	Ord.	2/-	10/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/3	Osborn (Samuel) & Co., Ltd.	Ord.	5/-	56/3
" " "	5% Cum. Prf.	£1	14/3xd		5% Cum. Prf.	£1	23/-
Churchill (Charles) & Co., Ltd.	Ord.	2/-	9/6	Pratt (F.) & Co., Ltd.	Ord.	5/-	18/9xd
" " "	6% Cum. Prf.	£1	25/4½	Sanderson Kayser, Ltd.	Ord.	10/-	40/-
Clarkson (Engrs.), Ltd.	Ord.	5/-	42/6		6% Cum. Prf.	£1	17/-
Cohen (George), 600 Group, Ltd.	Ord.	5/-	14/-	Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	12/3
" " "	4% Cum. Prf.	£1	12/6	Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	66/10½
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	32/10½	Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	19/4½
" " "	5% Cum.	£1	16/3	Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	19/6xd
Craven Bros. (Manchester), Ltd.	Ord.	5/-	10/1½		5% Cum. Prf.	£1	14/3
Elliott (B.) & Co., Ltd.	Ord.	1/-	3/7½	Stedall & Co., Ltd.	Ord.	5/-	8/7½
" " "	4% Red.	£1	12/-xd	Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	31/3
" " "	Cum. Prf.			Tap & Die Corporation, Ltd.	Ord.	5/-	18/3
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	11/-		4% Deb.	Stk.	82½
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Harper (John) & Co., Ltd.	Ord.	5/-	8/6	Ward (Thos. W.), Ltd.	Ord.	5/-	82/-
" " "	4% Red.	£1	11/9	" " "	5% Cum.	£1	14/-
" " "	Cum. Prf.			" " "	1st Pref.		
				" " "	2nd Pref.	£1	22/6
				Willson Lathes, Ltd.	Ord.	1/-	3/4½

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* Sheffield price.

‡ Birmingham price.



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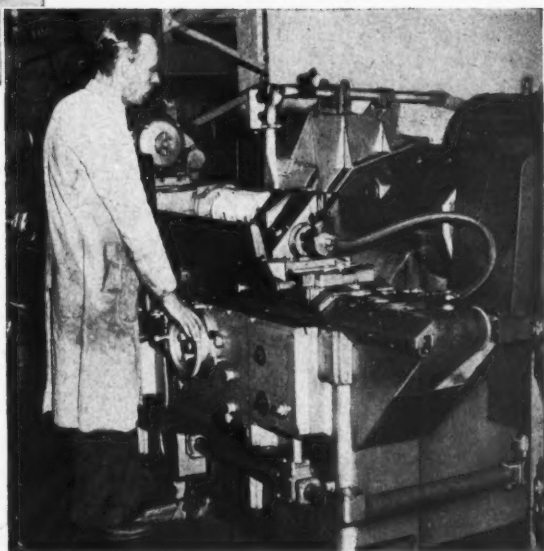


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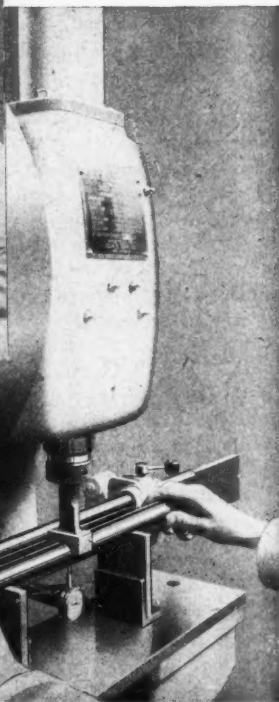
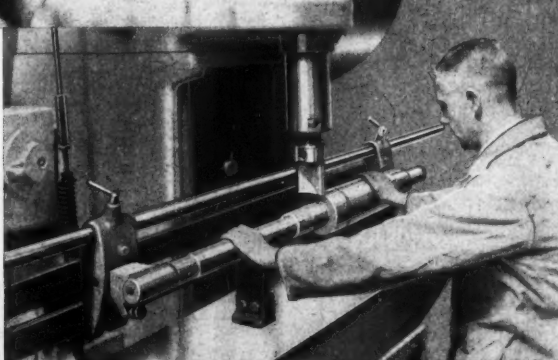
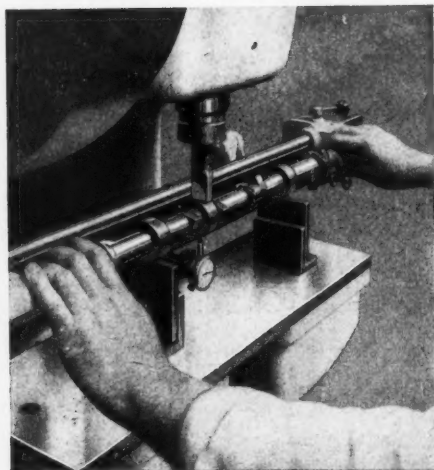
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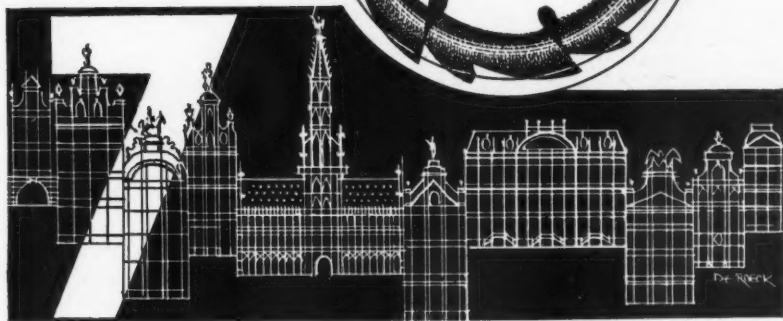
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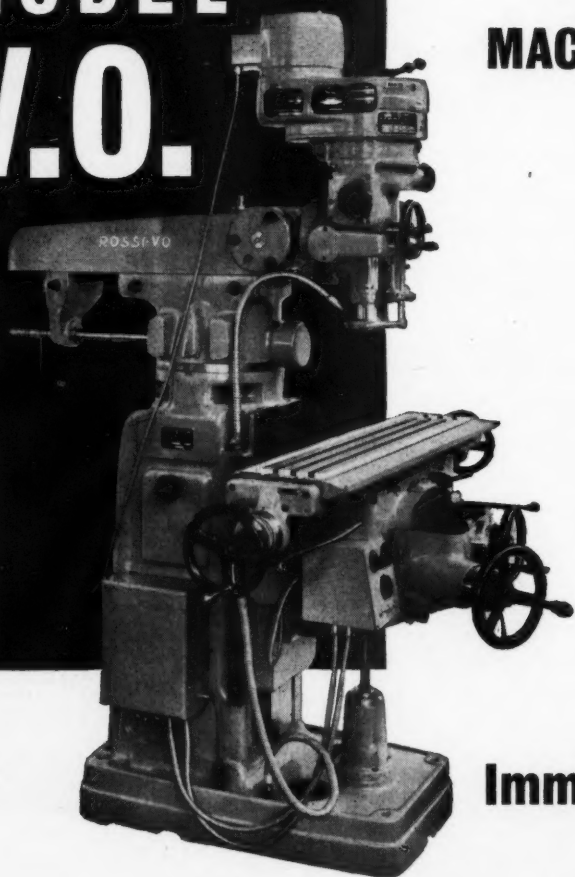
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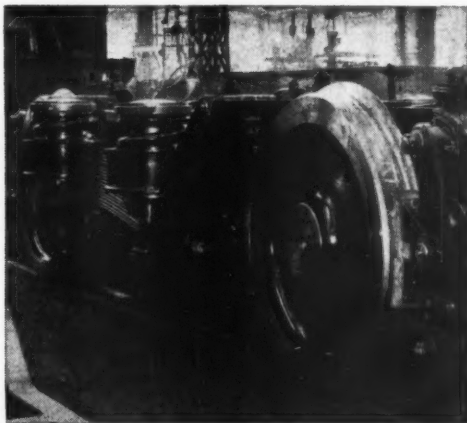
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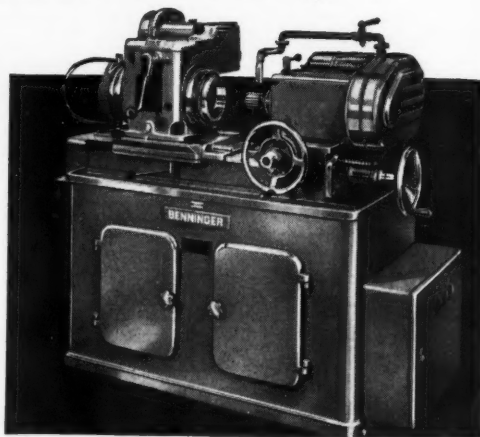


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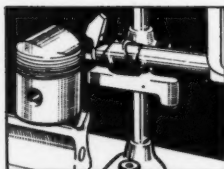
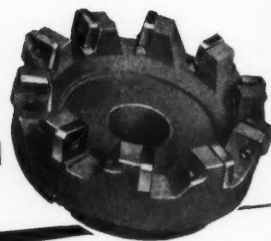
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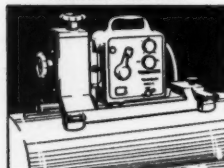
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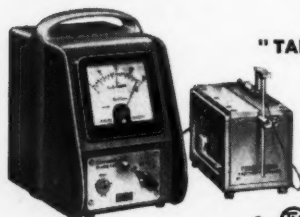
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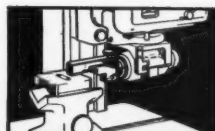
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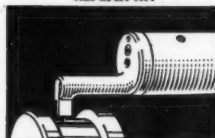
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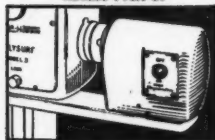
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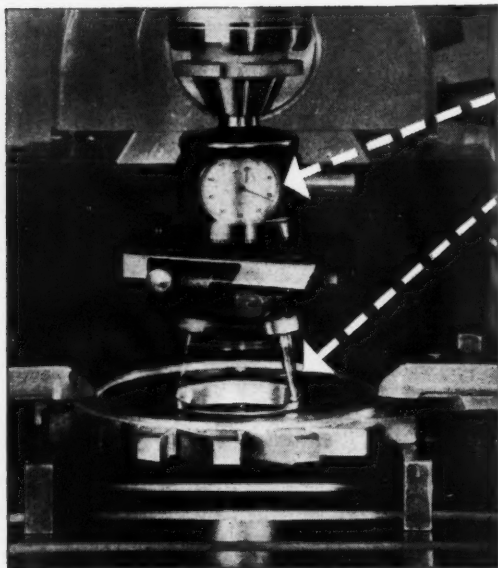
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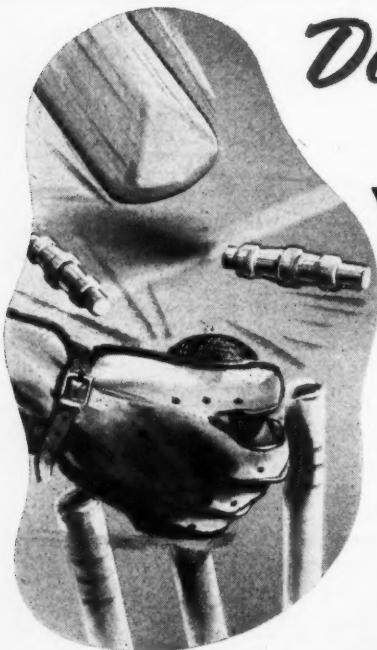


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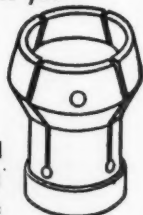
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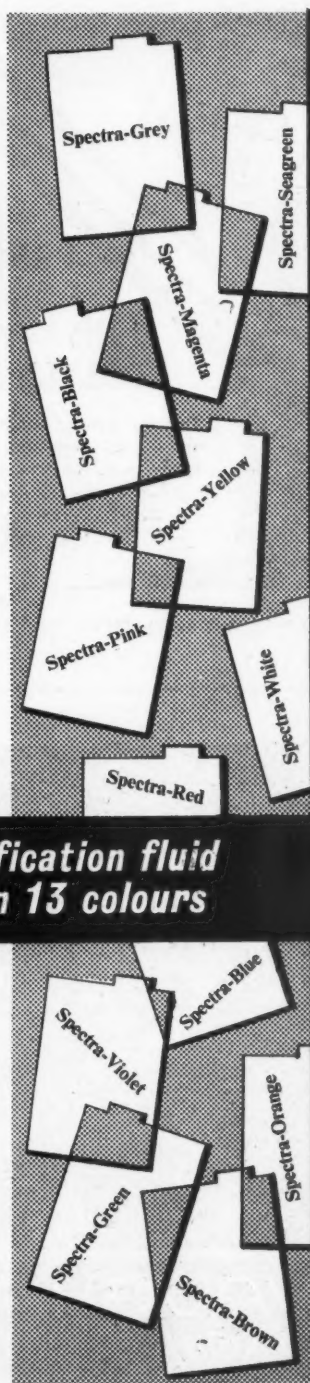
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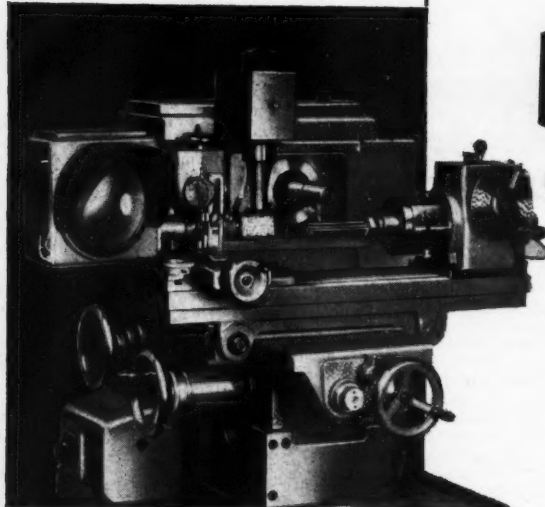




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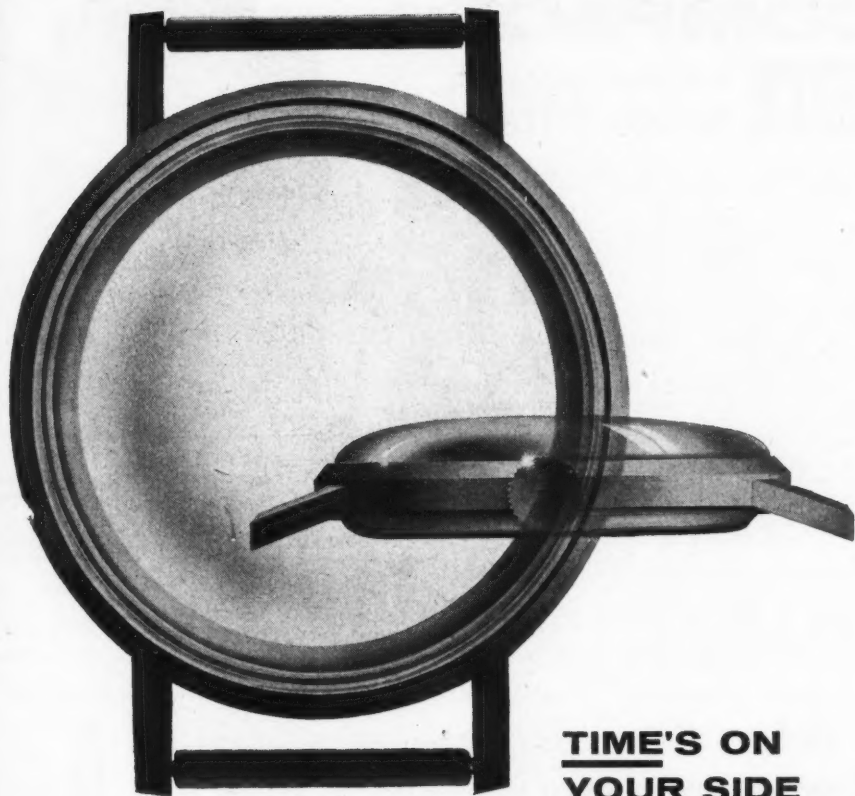
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Full flow is maintained through a deep bed of swarf which increases filtering efficiency and extends the useful life of the fabric.

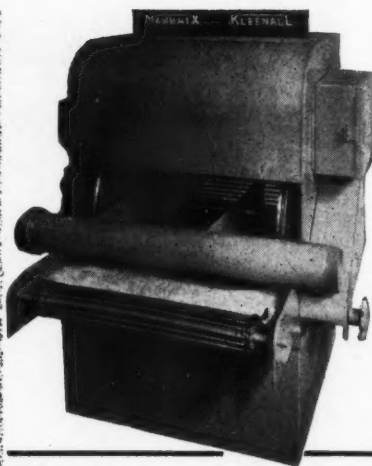
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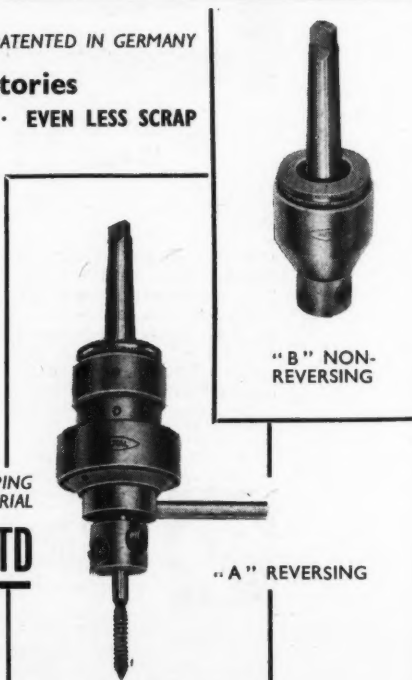
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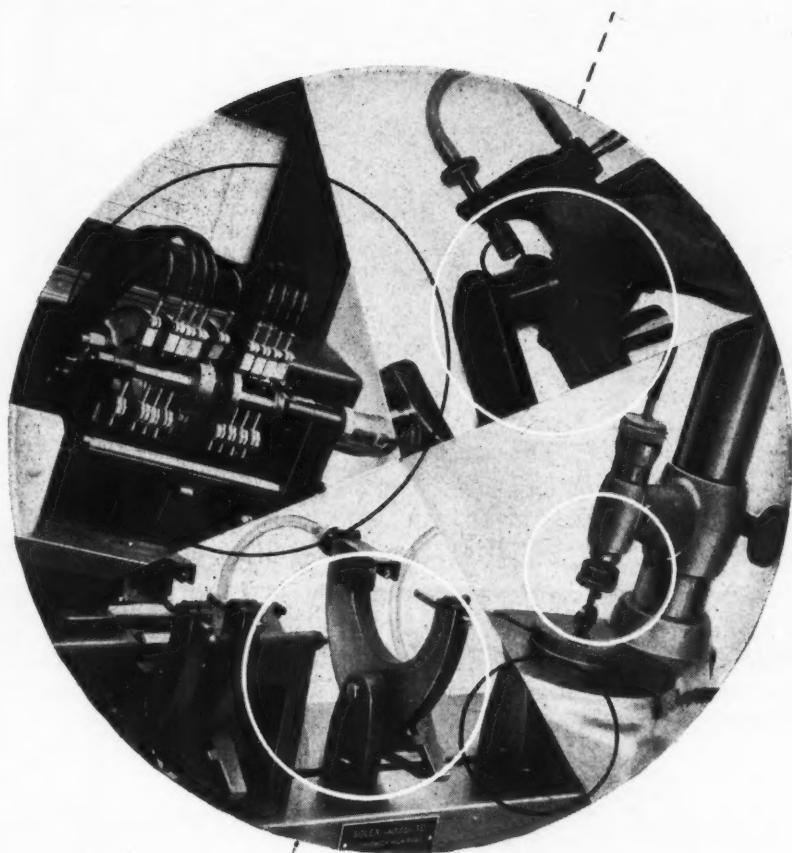
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ONLY **SOLEX** HAVE THE MEASURE OF THINGS

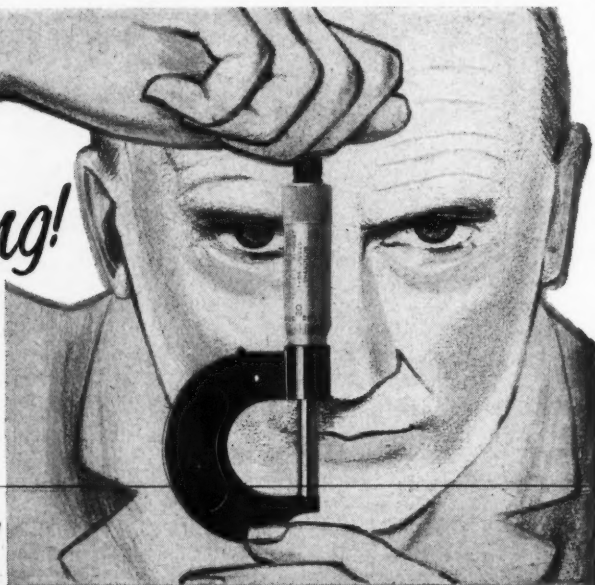
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**All types of press work
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**Deep draw work
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**Also milling, drilling,
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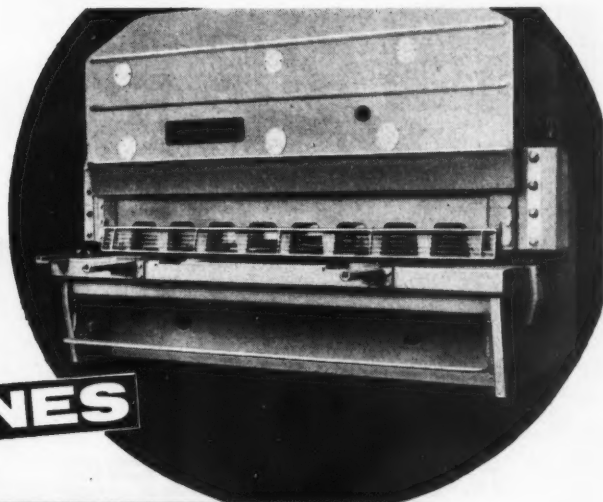
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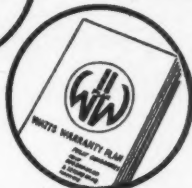
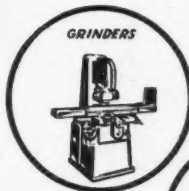
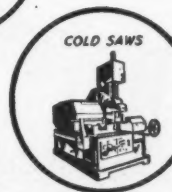
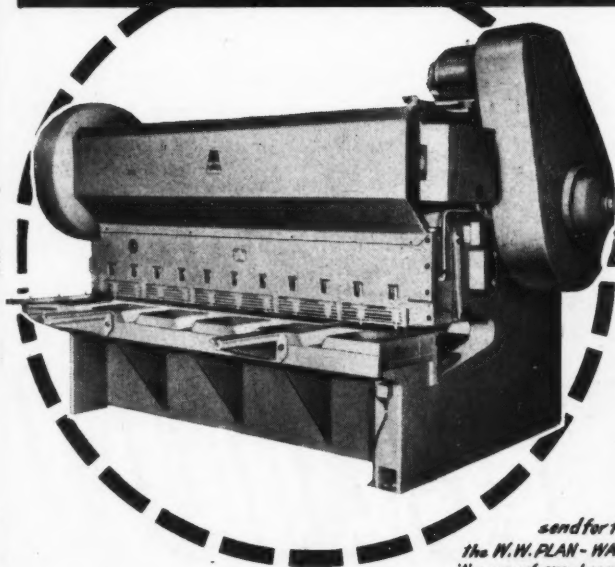
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MODEL	CAPACITY	GAP	NETT WEIGHT	HP	MOTOR
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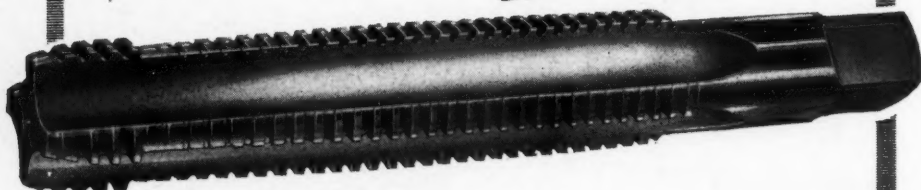
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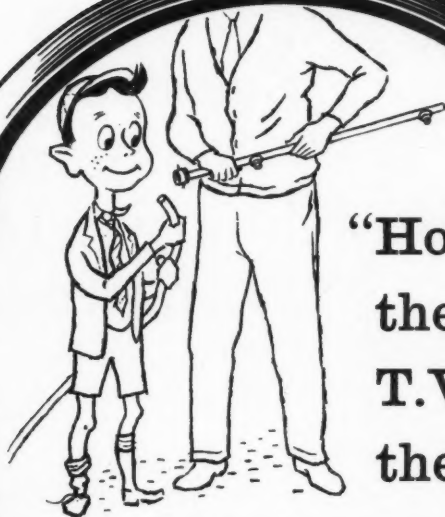
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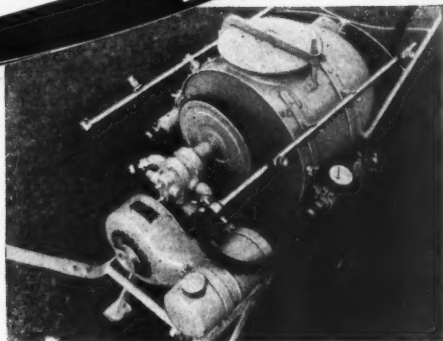
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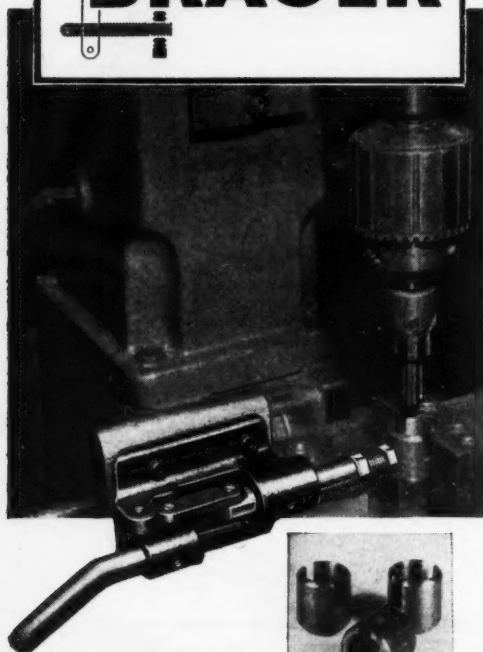
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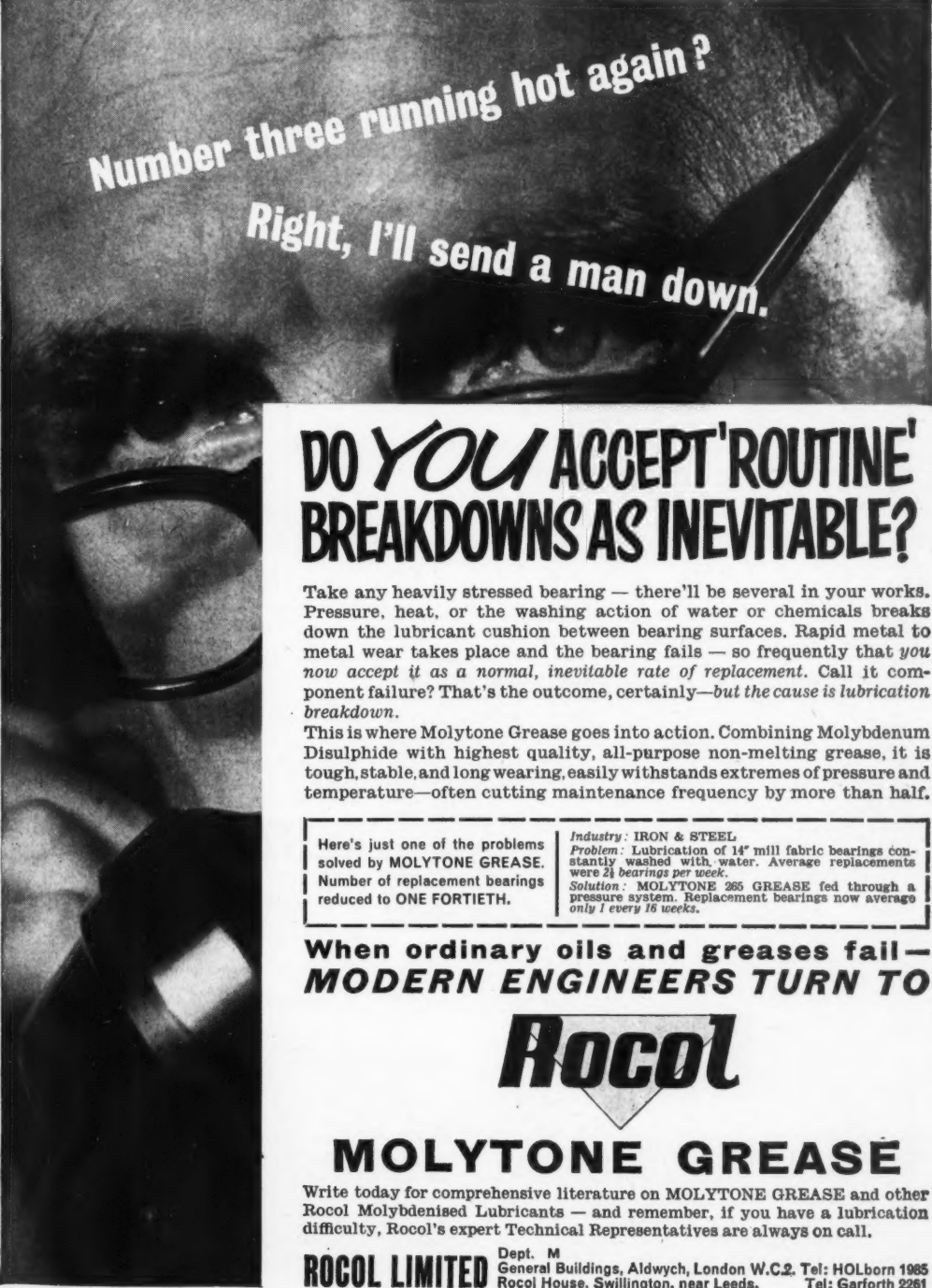
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and branches in
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5 VII



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Industry: IRON & STEEL

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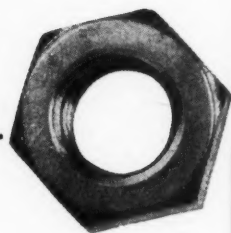
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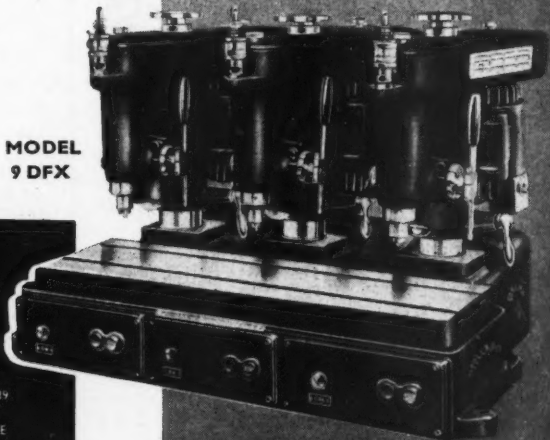
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MODEL
9 FX



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A positive displacement pump for ANY LIQUID

NEUMO Mark IVd (F)

AIR OPERATED PUMP UNIT



Guaranteed to pump any liquid no matter how corrosive, without damage to the pump or contamination of the liquid. The Pump itself is manufactured throughout of I.C.I. Fluon (Polytetrafluoroethylene) and is thus completely impervious to attack from all but Molten Alkali Metals and a few Fluorine Compounds at high temperatures and pressures.

**THIS PUMP MAY BE THE ANSWER TO
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*The Precise Answer
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**SPECIAL PURPOSE
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MATERIAL	Hardened die steel
IMPRESSION	1 1/2" dia x 3/32" deep
FINAL FINISH	30 micro-inches
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Sparking time:

1 hour 55 mins

THIS MEDAL DIE took 1 hour 55 minutes to make on the new GKN Spark Machine, Model B2. How long would it have taken by other methods?

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Whether you are engaged in forging, wire-drawing or press-tool making, the GKN Spark Machine is something it will pay you to know about. Ask our sales agents for an illustrated brochure on the GKN Spark Machine (Models B1 & B2). Ask them now.

The GKN Spark Machine

DESIGNED BY THE GKN GROUP RESEARCH LABORATORY

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**where you want it -
when you want it**

The Guyson range of Light Industrial Shotblast Cabinets covers all phases of Light Industrial Shotblast requirements in Toolroom, Production Bay, Laboratory or Repair Depot. These virtually self-contained units can be easily moved to any part of the production line to Clean, De-scale, Matt-finish or Metal Sheen components in Metal, Glass, Plastics, Ceramics, etc., saving valuable time.

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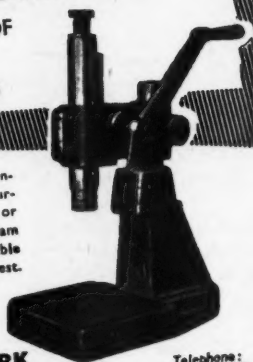
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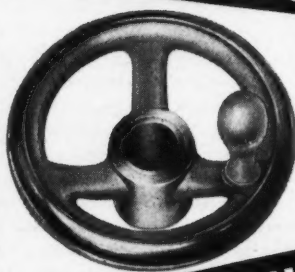


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PERCUSSION PRESS**

J. H. SHAND LTD.
AXMINSTER, DEVON

Telephone:
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HARRISON



DIE CAST
ALUMINIUM
ALLOY WITH
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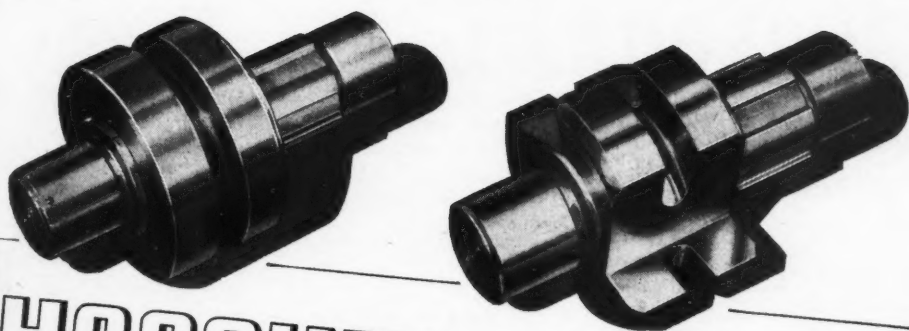
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CUNLIFFE & CROOM

Horizontals

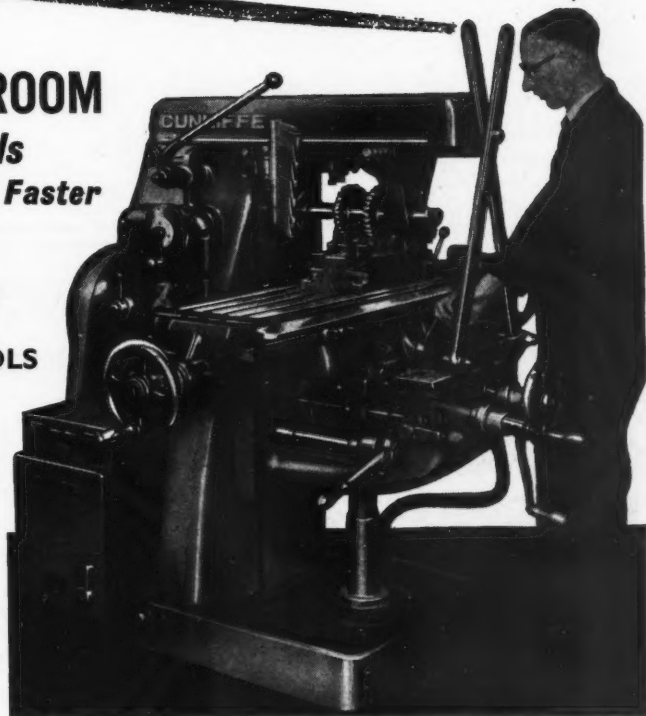
Do the job Better and Faster

- * AMPLE POWER
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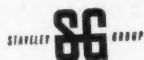
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These machines, with their massive rigidity and ample power, are capable of real 'hogging' or carrying out light finishing with the utmost precision.

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vertical miller

for precision

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for faster

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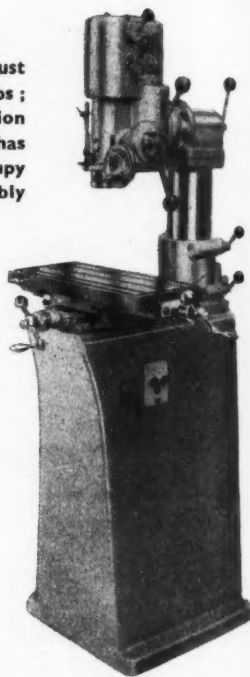
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The ARBOGA Vertical Miller is just the machine for the 'in-between' jobs; for big and small shops; for production or toolroom use. And every shop has 'in-between' jobs which at times occupy capacity that could be more profitably employed.

Abridged Specification:

Table size . 22in. x 9 $\frac{1}{2}$ in.
8 speeds . 100-2900 rpm.
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20 in. max.
Quill travel . . 4 $\frac{1}{2}$ in.
Coarse and fine down
feed.
Single or 3 phase
electrics.



Prices:

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Rotary table	66	0	0
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counters



Smiths Synchronous Hours Counters can be fitted to all A.C. Mains operated machinery, plant etc. Robust, reliable logging of accurate running times. Totals up to 10,000 hours, a trip Counter can be included.

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MARLCO

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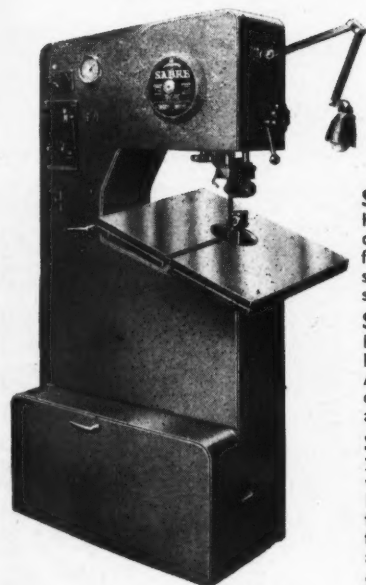
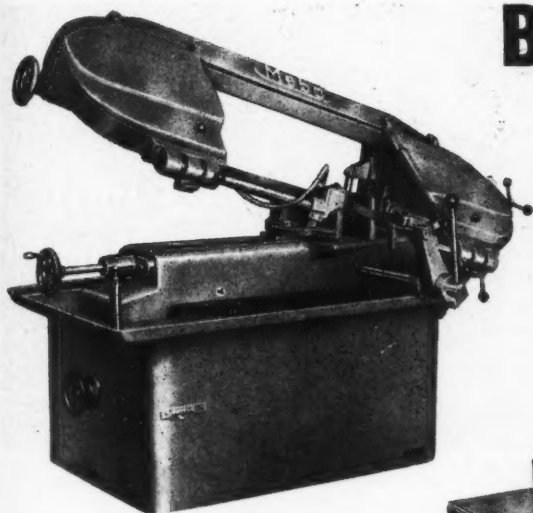


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*...the efficient
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Patent Application No. 8700,59

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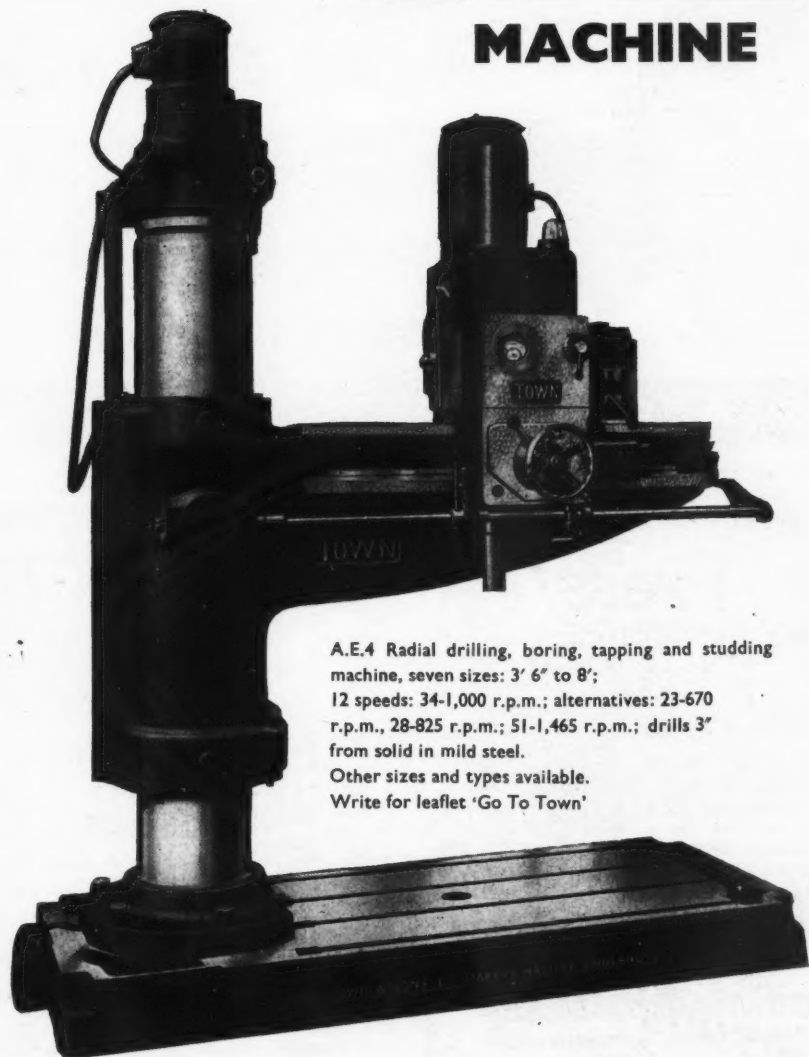
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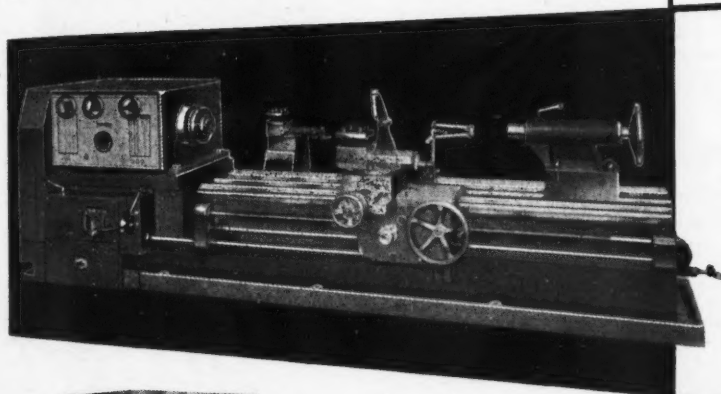
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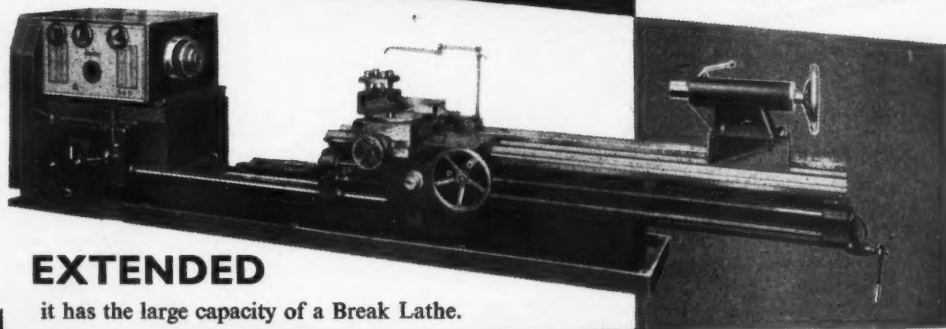
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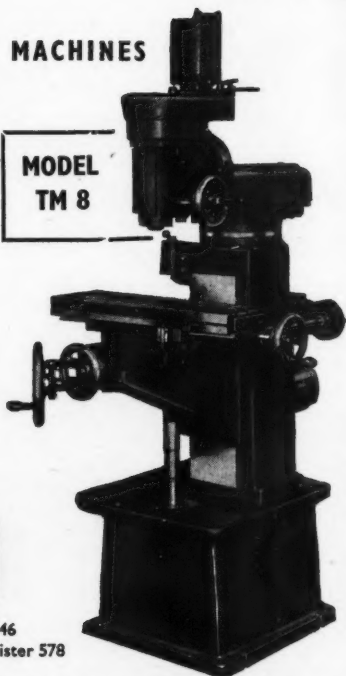
Model	Table	Table to Spindle
1	22in. by 6½in.	16in.
2	28in. by 6½in.	16in.
3	28in. by 8in.	15in.
4	28in. by 8in.	19in.
5	28in. by 10in.	19in.

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Radial and Sliding Arm, Swivelling and Down Feed Head. Power Feed to table optional.

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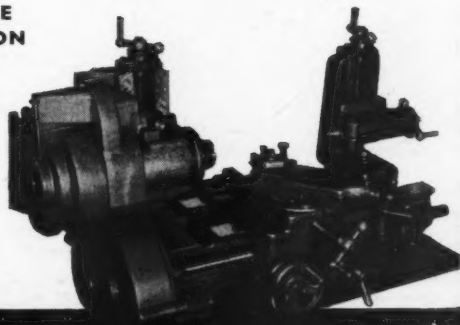


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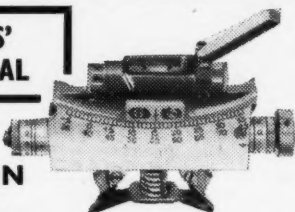
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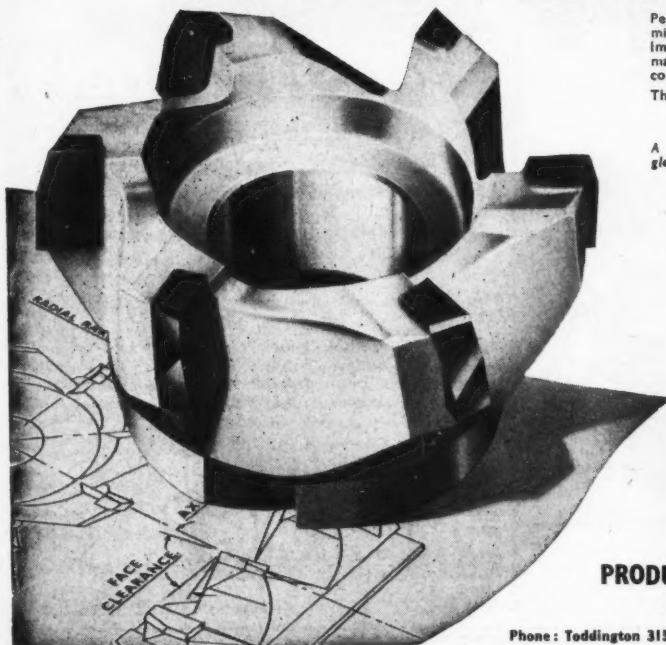
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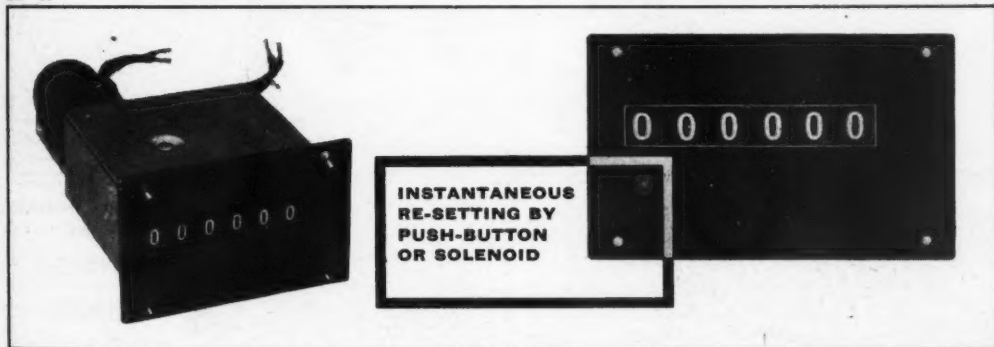
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Ram type Universal Milling Head

Speeds (12).....25—1,500 rpm.
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Spindle centre to column
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Head swivels...2 planes, both 180°

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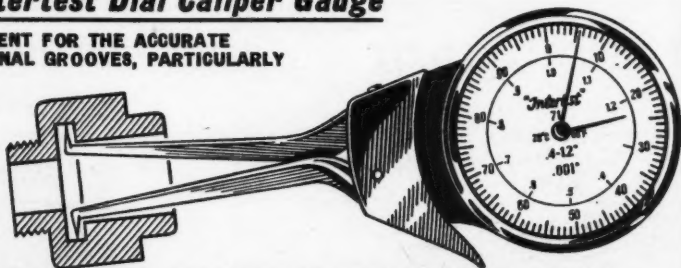
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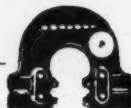
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73	12"-20"
74	16"-24"
75	20"-28"
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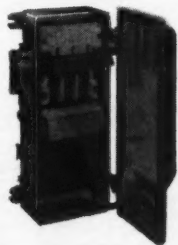
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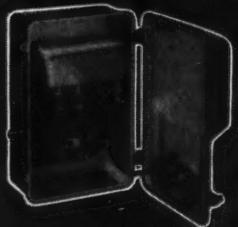
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Contactor Starter with
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Direct-on-line Contactor
Starter—up to 5 h.p. 550 v.
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Size 1—**

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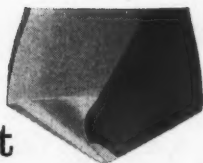


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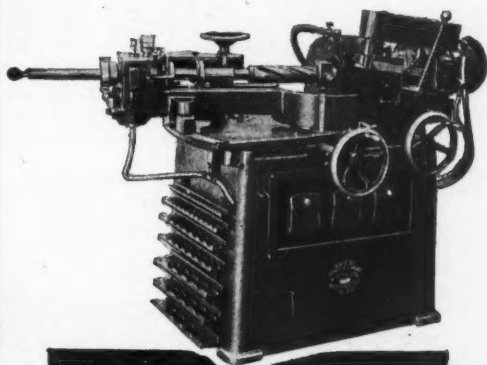
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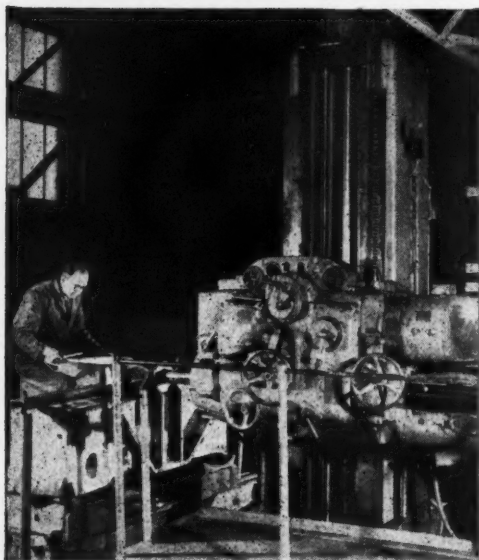
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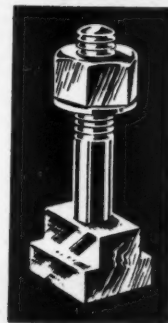
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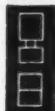
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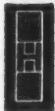
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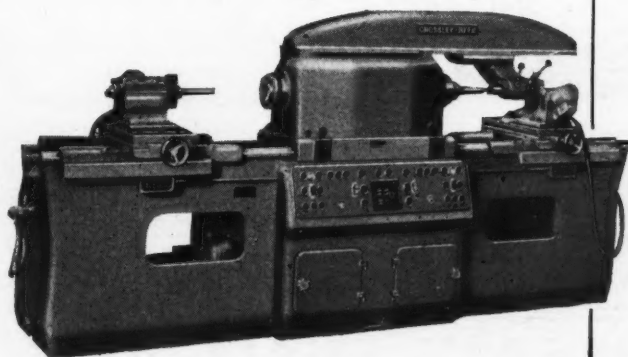
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adjustable
anvils and
fixed block
anvil. Range
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V.169	20in.	£12 7s. 6d.	£21 16s. 6d.	£19 9s. 6d.

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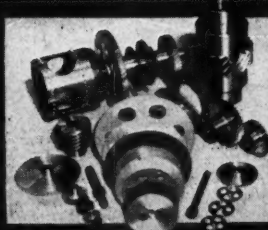
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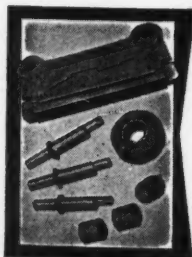
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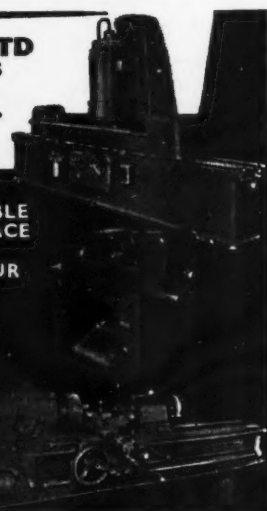
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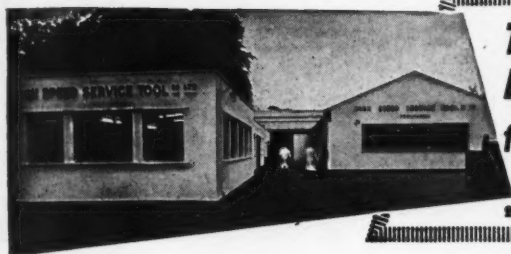
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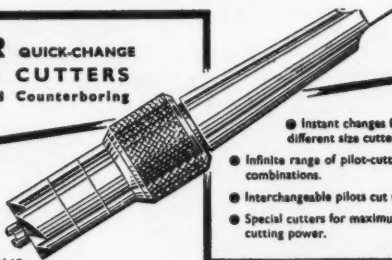
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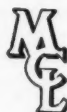
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CENTRE LATHES

SMART & BROWN Type M 4 in. Precision.
WARD, HAGGAS & SMITH 8½ in. Gap
Bed, 36 in. between centres.
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ARCHDALE 14 in. Manufacturing type.
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MILNES Sw. Hd. Vertical. Table 30 in. x
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HELLER Automatic Thread Millers (4).
ASQUITH HKO Duplex Keysetter.

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18 in. dia. magnetic chuck table. 12 in.
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£50.EDWARDS 48 in. x 14 Gauge Power
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Between Centres, 3 Jaw Chuck, Change-
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With covered Vee bed and roller bearing
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Boring Machine (Serial No. 3493), with
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Main table 2 ft. 6 in. x 4 ft. 0 in. Turntable
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Grinding Machine. Vertical spindle.

"MATRIX" Model 10B Universal Thread

Grinding Machine. Full set of equipment.

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Table 48 in. x 23 in., with side box.

BLISS 4½ Double Action Power Press, 5 in. punch

stroke. 27 in. between columns, with roll feed

WEBSTER & BENNETT 36 in. Vertical Boring

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Pentagon turret.

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ORCUTT Internal Gear Grinding Machine.

15 in. stroke, Indexing head. (New condi-
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GISHOLT Model 2L Combination Turret Lathe.

Speeds 12 to 353 r.p.m. Hollow spindle 4½ in.
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PENSOTT 14 in. Swivel Head Slotting Machine.

24 in. dia. Rotary table, Vernier calibrations.

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6 in. width of wheel.

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Newall-Keighley Plain Grinder

Type L12 24 in. x 12 in. Very good
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B.S.A. jin.

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Broadbent 14in. x 7ft., unused.
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Betts Bridgeford 15in. x 18ft.
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Adams No. 5 Thread Mill.

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Gisholt No. 3 Capstan.
Warner & Sweeney No. 3 Capstan.
Ward No. 2a Capstan Lathe.
Herbert 15 Capstan Lathe.
Murad 3Q Capstan Lathe.

MISCELLANEOUS

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B. & S. No. 2 Die Press Grind.
Excel No. 1 Die Press Grind.
C.V.A. 10 Die Press.
Maiden Bar-riding Machine.
Rabens 4in. Radial Drill.
K. & W. 2in. Pillar Drill.
Granor 26in. H.D. Shaper.
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3 Ton Hi-ton Press.
S. Platt 3in. x 14ft. Tube Roller.
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Many other machines in stock.

All motorised 440/3/50.

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JONES & SHIPMAN No. 540 Surface Grinder. Capacity 18in. by 6in., hydraulic table feeds. Magnetic chuck, electric coolant.

SOMUA Horizontal Milling Machine. table 67in. x 14in. spindle speeds 32 to 1,250 r.p.m. No. 50 L.T. 18 feeds jin. to 10jin. per min., power feeds and rapid traverse in all directions. 1952 machine.

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Bilas 70 Ton Geared Double Sided Power Press. 400/3/50 supply.

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30 Ton Marshall Fleming, 29ft. span, cab control.

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Machine.—New ex stock.—C. DUGARD, LTD., Denmark Villas, Hove S2471.

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Lathe for sale. Between centres 18in. Length of bed 54in. Arranged motor drive 400/3/50.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

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WEBSTER & BENNETT Series D 36in. Single Column Type Vertical Boring Mill, motorised 400/3/50 supply.

SLOTTING MACHINES

ORMEROD 12in. stroke Slotting Machine, 27in. dia. rotary table, motorised 400/3/50 supply.

LATHES

CRIVEN 15in. S.S. & S.C. Lathe, to admit 16ft. between centres.

DEAN, SMITH & GRACE Surfacing and Boring Lathe, with hexagon turret, swing over bed 24in., swing in gap 36in.

LANG 12jin. Gap Bed S.S. & S.C. Lathe, to admit 10ft. 6in. between centres.

CRIVEN 15in. S.S. & S.C. Lathe, to admit 25ft. between centres.

LANG 15in. Centre Lathe, two saddles, admit 17ft. 6in. between centres, motorised 400/3/50 supply.

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CINCINNATI 10 ton Vert. Single Ram Hydraulic Surface Broaching Machine, 60in. stroke 20in. x 20 in. table, motorised 400/3/50 cycles.

GRINDING MACHINES

JONES & SHIPMAN 10in. x 27in. Horizontal Spindle Hydraulic Surface Grinder.

CHURCHILL Model EC Centreless Grinding Machine, 6in. capacity, motorised 400/3/50 cycles.

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New BUTTERLEY B31 Geared Open Fronted 75 Ton Power Press, 1in.-5in. adjustable stroke.

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NOBLE & LUND 24in./28in. Cold Circular Sawing Machine, 10in. dia. rounds, 9in. squares, 18in. x 7in. seams, motorised 400/3/50 cycles.

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RICHARDS No. 1, 2 and 4 Horiz. Borer.
WEBSTER & BENNETT 36in. Vert.
Borer.

W. FORREST & CO. LTD.,
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TOWN Radial, 1½in. capacity.
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IMMEDIATE DELIVERY

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Max. dia.	3C
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6 in.
1 in.
18/10 in.
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Will cut Int. & Ext. Spur, Helical and Double Helical Gears. Both late type machines.

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ALL REBUILT.

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Also a number of other Lathes 7in., 7½in. and 8in. Centres.

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RIVET Instrument Lathe, 44in. x 24in.

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CENTEC No. 3R Auto-cycle, pro mill.
HEY Duplex Spindle Mill. £175.
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As new.

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Guillochine, with 19in. gaps. 4 h.p.,
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WICKMAN 14in. 5 spindle. 1941 machine.
WICKMAN 6in. 5 spindle Chucker.

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ASQUITH 4ft. 6in. O.D.1 Radial Drill.
ASQUITH 4ft. O.D.1 Radial Drill.
PROGRESS 5E. Round table.

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Model 61 FELLOWS Gear Shaper. Straight
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SOUTHBEND 16in.
EDGWICK 7in.
DEAN, SMITH & GRACE. Height of
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MONARCH 22M S.S. Taper Turning Lathe.
WARD 10 Combination Turret Lathe.

MILLING

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28in. ARCHDALE Rapid All Ways.
18in. EDGWICK Production Mill.
CINCINNATI No. 5 High Power Plain Hor.
1942 machine.
KENDALL & GENT C.V.M.40.
KENDALL & GENT C.V.M.25 Vertical Mill.

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6ft. x 12g. between columns. Delivery
10 weeks.

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All machines motorised 400-440/3/50.

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MILLING MACHINES

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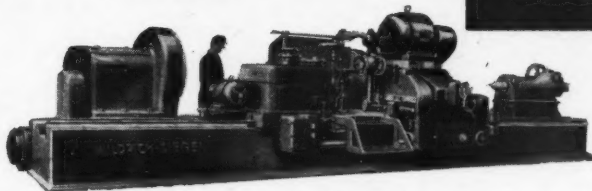
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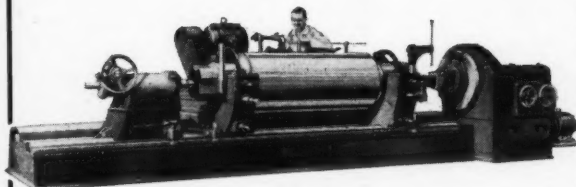
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Internal Grinder complete with Hydraulic Wheel Dressing device, Spindle, etc.

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Model W/S/M Series 111 Machine with all electrical equipment. Extra equipment: Depth stop incorporating scale, dial indicator and automatic knock off switch.—BOX D25, MACHINERY, Clifton House, Euston Road, N.W.1.

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spindle speeds 445 to 3,025 r.p.m. 3 feed changes 70, 105, 140, 1 1/2in. dia. spindle bore. 5 h.p. motor. 400-440/3/50.—BOX C910, MACHINERY, Clifton House, Euston Road, N.W.1.

**Essex No. 32 Punch Shaper,**

Adjustable stroke 52, 36 and 65 strokes per min. Swivel of tool adjustment 0-90 deg. Dividing Head. In "as new" condition.—BOX C905, MACHINERY, Clifton House, Euston Road, N.W.1.

**Butters Bros. Derrick Crane 3**

tons capacity, 90ft. 0in. jib, cabin type. All electric and in excellent condition.

Further details from:—

**C. & G. OLDFIELD, Ltd.**  
15, Abercorn Street,  
PAISLEY.

**Acme Gridley Model G. 7in.**

Four Spindle Bar Automatic, 400/3/50.—**HICKS MACHINERY, Ltd.**, 26, Addison Place, London, W.11. Tel.: PARK 2333.

**18in. Stroke Butler All-geared**

Shaping M/c. 8 speeds 10-120 s.p.m. Table 17in. x 13in. x 14in. 20in. long. traverse.—**LEE & HUNT LTD.**, Crocus Street, Nottingham. 'Phone 94246.

**Herbert No. 4BS Capstan Lathe.**

Full Turret Equipment, etc.

Further details from:—

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**Semi-Automatic Thread Milling**

Machine by Hanson Whitney. Capacity 4in. dia. x 9in. long. Collet capacity 2in. External cap. 4in. dia. max. with 2in. cutter. Internal cap. 1in. dia. min. with 1/2in. cutter. Some equipment available.—BOX C931, MACHINERY, Clifton House, Euston Road, N.W.1.

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# GATE

## MACHINERY CO., LTD.

176/178, Victoria Road, Acton,  
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**GRINDERS**  
**JONES & SHIPMAN** 540 Surface  
Grinder.

**ROBOT** 6in. x 18in. Surface Grinder.  
**NEWMAN** 10in. x 24in. Universal  
Grinder.

**BROWN & SHARPE** No. 2 Surface  
Grinder.

**HORTSMAN** Thread Grinder, capacity  
5in. dia. x 9in. b.c.

**BROWN & SHARPE** No. 5 Cylindrical  
Grinder.

**FRITZ WERNER** Model 270A Cylindrical  
Grinders, 3 1/2in. x 7in. b.c.

**BROWN & SHARPE** No. 13 Universal  
Grinder.

**BRYANT** No. 5 Heavy Duty Internal  
Grinder.

**BENTLEY** Form Cutter Grinder.

### LATHES, CAPSTANS

**D.S.G.** 8 1/2in. x 48in. Gap Bed, 19-418 r.p.m.  
**D.S.G.** 8 1/2in. x 30in., 11-490 r.p.m.

**HOLBROOK** 8in. x 36in., 11-400 r.p.m.  
**COLCHESTER MASTER** 6 1/2in. x 36in.  
Adjustable Screwing Attachment.

**LE BLOND** "Regal" 7in. x 40in., 25-500  
r.p.m.

**EMPIRE** 6 1/2in. x 40in. Lathe.

**SOUTHBEND** 5in. x 24in. Bench Lathe.

**BOYES & EMMS** S.S. & S.C. Lathe, centre  
height 16in. x 7ft. 6in.

**ROLLO** 6 1/2in. Centre Lathe.

**HENDY** 13in. x 30in. S.C. Lathe.

**RIVET** 4in. x 18in. b.c. Precision Lathe.

**WARNER & SWASEY** No. 3 Capstan.

### MILLERS

**CINCINNATI** 8in. x 18in. Tool and Die  
Miller.

**EDGWICK** No. 2 Universal, 46in. x 11in.  
table, 24-405 r.p.m. Vertical Attachment  
Dividing Head.

**TRIDENT** Vertical, table 30in. x 8in.,  
75-750 r.p.m.

**CINCINNATI** 1-18 Production Miller.

**KENDALL & GENT** Vertical Miller,  
table 69in. x 19in., speeds 20-300, rapid  
traverses.

**SCHIESS DEFRIES** Vertical Keyseater.  
**MAMMUT** 10in. x 23in. Table Horizontal  
Mill, hand lever operated.

**FRITZ WERNER** 10in. x 34in. Horizontal  
Mill.

**BROWN & SHARPE** No. 2 1 1/2in. x  
49in. Horizontal Mill, speeds 15-376.  
Feeds 3/10-15 I.P.M.

**PRESSES, SHAPERS, PLANERS AND HOBBS**  
**BUTLER** 14in. Production Slotter.

**INVICTA** 5in. Shaper.

**ORMEROD** 8in. Toolroom Slotter.

**CHURCHILL-REDMAN** 32in. Stroke  
Heavy Duty Shaper. Excellent condition.

**ESSEX** No. 32 Punch Shaper.

30-ton **RASKIN** Double Sided Double  
Geared Drawing Press. Area 20in. x  
23in. Draw 4 1/2in.

New **FOREBA** Model HDA.80 Planer,  
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by Heid gearbox.

**DOWDING** V8 Gear Hobber.

### DRILLS

**POLLARD** 4-spindle Pedestal Drill,  
2-2MT 2-3MT.

**POLLARD** 3-spindle Pedestal Drill, 3MT,  
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**POLLARD** 13 AX Pedestal Drill.

**FROGRESS** 4E Pillar Drill.

**TAUCO** 4in. Bench Drill.

**BOLEY** Multi Drill VB 10in.

**CORONA** 13in. 2AP Sensitive Pedestal  
Drill.

**CORONA** 20in. Pedestal Drill.

15HEF 4 Spindle Drill.

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**CANNING** Double Ended and Centreless  
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**RICHARDS** 72in. Double Column  
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**PADDON** MK3 type WP Cylinder  
Re-boring Machines.

**PERRIN** Model AV-1 Miniature Jig  
Borer (almost new).

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**BOLEY-LEINEN** Model ER15 3in.  
Capstan (modern).

**HERBERT** No. 2 Pre-optive Bar  
Turret Lathe, Flamard bed, 2in.  
capacity with bar feed, full turret  
cooling.

**LIBBY** 2H 8in. spindle Turret Lathe.

**MURAD** Model 3Q 3in. Capstan  
Lathe.

### CENTRE LATHES

**LANG** 10 1/2in. by 10ft. between centres  
Centre Lathe, with taper turning.

**SOUTHBEND** 7in. Centre Lathe.

### DIESINKING MACHINES

**NASSOVIA** Model V.11 Hydraulic  
Diesinker. Mould capacity 27 1/2in.  
by 19 1/2in. by 23in. height. (Unused.)

**VICTORIA** Diplomatic Hydraulic  
Copy Milling Machine, 8in. by 8in.  
(NEW).

### DRILLING MACHINES

Two **CORONA** Model 31A Heavy  
Duty Pillar Drills.

**CRAFTSMAN** 3in. Bench Drills;  
four at £25 each.

Various **ACIERA** Precision Bench Drills.

### GRINDING MACHINES

**LAMBERT** Model 73 Watchmaker's  
Cutter Grinder (two).

**CRAYEN** Heavy Duty Roll Grinding  
Machine with capacity for rolls  
42in. dia. by 12ft. between centres  
and fitted with automatic cambering.  
Will take rolls up to 25 tons weight.  
Fully motorised machine of modern  
design. WEIGHT 25 tons.

**CINCINNATI** No. 2 Tool and Cutter  
Grinding Machine.

**COVEL** No. 2 Tool and Cutter Grind-  
ing Machine.

**MATRIX** No. 16G Plain Straight  
Thread Grinder.

**MATRIX** No. 6 Internal Thread  
Grinders, 3in. by 10in.

**HEALD** Model 81 Sematic Internal  
Grinder.

**WOLTERS** Model I.L.I Hydraulic  
Internal Lapping Machine.

**PETWE** Model 3D Profile Grinding  
Machine. (Nearly new.)

### MILLING MACHINES

**EDGWICK** No. 2 Vertical Mill.

**VICTORIA** Diplomatic Hydraulic  
Diesinking Machine (almost new).

**FRITZ WERNER** No. 3230 Precision  
Vertical Milling Machine, 24in. by  
8in. table, longitudinal and cross  
power feed to table.

**EDGWICK** No. 1 Horizontal Milling  
Machine, 40in. by 10in. table.

Four **DENBIGH** Model No. C4  
Horizontal Milling Machines.

**SANT ANDREA** Model U.F.O/5  
Extra heavy duty Horizontal Miller,  
86 1/2in. by 19in. Table travel 67in.

**VICTORIA** Model U1 Universal  
Milling Machine of latest type, in  
excellent condition.

**VICTORIA** Junior Omnimil (New).

Two **ARCHDALE** 18in. Automatic  
Cycle Kneeless Production Millers.

**MILWAUKEE** Model 2CE Horizontal  
Miller (dial type) (nearly new).

**MILWAUKEE** Model 3CE Horizontal  
Miller (dial type) (nearly new).

**ASQUITH** Model 28V Vertical Milling  
Machine, table 50in. by 15in.

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**ESSA** Type PL 6,000kg. High Speed  
Precision Double Sided Press (five  
machines).

**RHODES** 3-ton Open Fronted Bench  
Press with flange motor and **UDAL**  
guards.

**LEE & CRABTREE** 15-ton Honing  
Press.

**LEE & CRABTREE** 20-ton Honing  
Press.

**LEE & CRABTREE** 35 Double  
Action Mechanical Press.

**BLISS** Model 20B 27 tons Power Press.

**H.M.E.** Model DCP3 70-ton Double  
Sided, Double Crank, Single Action  
Power Press.

New **MULLER** Model AMP 15-ton  
Power Press.

Three New **MULLER** Model AMP  
22-ton Power Presses.

Three New **MULLER** AMP 35-ton  
Power Presses.

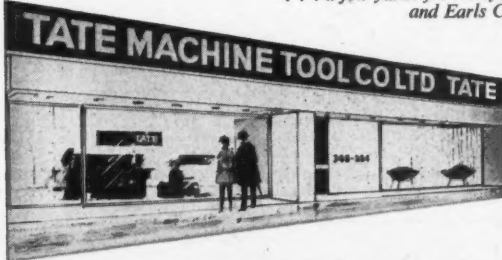
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Power Presses.

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Power Presses, Open Fronted.

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Power Presses.

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KEARNS No. 2

**BROACHING**

AMERICAN Model H2, stroke 3pin.

**CARPAS**

HERBERT 2S.

MURAD 4in.

HERBERT 4B.

**DRILLS**

DENBIGH 24in. B.G.

HERBERT "C" Power Feed.

CORONA No. 21 AR, No. 3 M.T.

JONES &amp; SHIPMAN 8in. 1/2in. cap.

CORONA IAX, No. 1 Morse Taper.

CORONA 15HF, 1/2in. cap.

LELAND GIFFORD 2-sp., No. 2 M.T.

HERBERT Type B. Single Spindle, 1/2in.

CORONA 6MX Cluster Type.

HERBERT Type H, 1/2in. dqp.

CORONA 12AX, 1/2in. cap.

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LIENHARD 3 Dimensional (New).

LIENHARD No. 1H.

HUFFIELD Router.

T.T. &amp; H. Type C, C.B. and M.A.

T.T. &amp; H. Multi Etcher.

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JONES No. 13 Bandsaw.

Wickstead No. 1 Hacksaw.

RAPIDOR 6in. Hacksaw.

RAPIDOR Filing.

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Sheet Edging, 30in. x 22g.

**GEAR CUTTERS**

SAFAG Pinion.

MAXICUT 7in. x 2in. x 6 D.P.

PETERMAN No. 1 and 2.

**GRINDERS (Surface)**

CHURCHILL RBY 24in. ring.

CAPCO No. 2, 14in. x 6in.

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LUMSDEN Vert. 210 XXM.

SNOW Table, 20in.

ABRASIVE No. 34 Vertical Spindle.

ABRASIVE No. 11in. hand.

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**GRINDERS (Cylindrical)**

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ABWOOD Carbide.

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HUNT No. 0 and 1 Tap Regrinders.

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BENTLEY 5in.

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EDGWICK 4in.

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DENHAM 4 1/2in. x 24in. S.S. &amp; S.C.

LE BLOND Production, 11in.

RIVET S.S. &amp; S.C. 4in. Model 602.

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WILLSON 7 1/2in. S.S. &amp; S.C.

COLCHESTER TRIUMPH 7in. S.S. &amp; S.C.

SWIFT 12SV5 Facing and Boring, 48in.

MONARCH 10EE x 22in. S.S. &amp; S.C.

SMALLPIECE 9SW Multi-tool.

RIVETT 3 1/2in. Plain. Model 715.

WARD, HAGGAS &amp; SMITH 8 1/2in. x 78in.

RYDERMATIC No. 12 Multi Tool.

BERRY 6in. S.S. &amp; S.C.

**MARKING MACHINES**

FUNDITOR "Sand Jet."

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LUKE &amp; SPENCER 38in. x 4 HP Polisher.

CANNING 54in. x 2 HP Polisher.

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CINCINNATI 1/18 Production.

DENBIGH Type C4. Table 46 x 10.

ROSCHE EICHLER. Table 39in. x 12in.

ST. ANDREA Model UFO3. Table 57 x 14.

KENT OWEN 1/8 Production.

HARDINGE Precision. Table 25 x 6 1/2.

WERNER. Table 14 x 5.

JONES 225 Univ. Table 22 x 6.

ARCHDALE 20in. dial. &amp; 14in. mfg.

RICHMOND O3. Table 40 x 10.

U.S. Multi Mill. Production.

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C.V.A. 79 Tool and Die.

PALLAS VI. Table 30 x 8 1/2.

REED PRENTICE No. 5, 68in. x 16in. table.

MILNE. Table 30in. x 8in.

WADKIN Type LXIA. Table 36in. x 13in.

**PRESSES (Power)**

BLISS No. 16 Bar.

LEGRA No. 8 C/Tons.

WRIGHT Clicking Press.

SCHULER VZZ. 15 tons d/s gripper feed.

**PROFILING MACHINE**

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HIGH SPEED Hammer, 7/16 cap.

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GSP 9 1/2in.

**EDGEWICK.****TAPERS**

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ACE Horiz., 1in. capacity.

J. &amp; S. Electrotap, 1/2in.

**THREAD MILLERS**

JONES F81, 4ft. between centres.

WICKMAN MOULTON 1B.

**One Secondhand Scrivener No. 1**  
Centreless Grinding Machine, maximum capacity 1 1/2in. diameter with Plunge Feed. Hand Operated. Motorised 400-440/3/50.

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**15in. Centre "Dean, Smith & Grace" Type 4/9D m/d. all-eg. S.S. & S.C. Lathe with taper turning attachment. 11ft. box end gap bed. 5ft. 6in. c.b. 48in. dia. in gap. 5 h.p. 415/50 motor. 16 spindle speeds 9-180 r.p.m. Spindle boring 3 1/2in. dia. —LEE & HUNT, LTD., Crocus Street, Nottingham. 'Phone 84246.**

**Alba 24in. Shaper. Ormerod**  
18in. Shaper.—C. DUGARD, LTD.  
Denmark Villas, Hove 32471

**Cincinnati No. 3 Vertical Milling**  
Machine. Speed Range 18-1,300 r.p.m. Dial Type.

Further details from:—  
C. & G. OLDFIELD, LTD.,  
15, Abercorn Street,  
PAISLEY.

**Coulthurst 9 1/2in. and Lang 8 1/2in.**  
All Geared Head Surfacing and Boring Lathes, 400/3/50.—HICKS MACHINERY, LTD.,  
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**Production Miller, Olivetti auto-**  
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**Box Tables, cast iron, for sale.**  
79 1/2in. x 23 1/2in. x 28in. Machined short ends and two opposite sides. Other two sides open. Ends have 1 1/2in. diameter holes, sides have slots 8in. x 2in. and 3in. x 2in. Well ribbed. Photo.—F. J. Edwards LTD., 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

**Taylor & Challen B3 1/2in. Power**  
Press, 60 Ton capacity, 3in. stroke. Fitted 9in. double roll feed. Motorised.—WILCOX & CO., Barr Street, Birmingham 10. Northern 1234/5.

**Aluminium Die Casting Machine.**  
E.M.B. No. 9 Die Casting machine for disposal in perfect condition with furnace. Suitable for brass or magnesium aluminium castings up to 3 1/2lb. in weight or 45 square inches. Space required—No reasonable offer refused.—LEWDEN METAL PRODUCTS LTD., Leyton, E.10. Telephone: LEYtonstone 4482

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spindle 16/23, double indexing. Complete with compound slides and chucks.—HENRY KIRK (MACHINE TOOLS) LTD., Yate, Bristol. Tel.—Chipping Sodbury 3081.

**Archdale Snout Borer, Modern**  
machine. Spindle dia. 5in. Table area 65in. x 19in. 7.5 h.p. Spindle nose 50 Int. taper. Rapid power approx. to work. Auto change-over to feed and run. Fast return electrically controlled.—BOX, C770, MACHINERY, Clifton House, Euston Road, N.W.1.

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Grinder—late machine.—C. DUGARD, LTD., Denmark Villas, Hove 32471.

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Horizontal Milling Machine, W.S.O.T. 7in. x 44in.

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**GRAY Planing Machine**

72in. x 72in. x 20in. open sided in as new condition, half new price, present day model lying in our U.S.A. Warehouse.

Price ex works U.S.A. £22,000.

**K & C Machinery Ltd.**  
STEPHEN ST., COVENTRY. 23669

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## F. J. Edwards Ltd

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MIDSAW 21in. Toolroom canting body Band-sawing machine.  
 TAYLOR No. 1142 high speed Circular Sawing Machine, capacity bar 4in. dia., tubes 1 1/2in.  
 SPEEDAX 16in. Bandsawing Machine for metal, wood and plastics. (New).

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KENDALL & GENT 3in. tangential die head Screwing Machine with leadscrew.  
 LANDIS 2in. Tangential Die-Head Screwing Machine.  
 LANDIS 1 1/2in. Tangential Die-Head Screwing Machine.  
 OSTER 6in. Screwing Machine, Cutting off Attachment, large quantity of dies.

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BETTS 12in. Slotting Machine.  
 SWIFT 20in. Slotting Machine.  
 INVICTA 6in Shaper, 24in. stroke.  
 ALBA 6in Shaping Machine, 24in. stroke.  
 BUTLER 12in. shaper.  
 BROOK 24in. Shaping Machine, swivel table and auto. hold down feed. (New).  
 ORMEROD 26in. stroke Traversing Head Shaper: two universal tables (1953).

### TAPPING MACHINES

JONES & SHIPMAN "Electrotap" Vertical Tapping Machine, leadscrew control with auto cycle for depth, reverse and stop, 1 1/2in. stroke, 200 r.p.m.  
 HERBERT 1 1/2in. No. 1 Flashtapper.

### BORING MACHINES

NEW SWEDISH Precision Horizontal Boring Machines, 3in. and 3 1/2in. travelling spindle, with facing head and screw cutting motion. (Sole British Agents).  
 KEARNS OB Horizontal Boring, with screw-cutting motion, covered bed spindle 2 1/2in.  
 GIDDINGS & LEWIS No. 0 Horizontal Boring Milling and Drilling Machine. 3 1/2in. traversing spindle, table 45in. x 27 1/2in.  
 CAPSTAN & TURRET LATHES & AUTOS  
 WARNER & SWASEY 3A Turret Lathe: 4 1/2in. hollow spindle, 23 1/2in. dia. swing over bed covers.  
 HERBERT No. 7 Combination Turret Lathes, hollow spindle, 2 1/2in. dia., 16in. swing, speeds 18-366 r.p.m.  
 HERBERT No. 12 Combination Turret Lathe: roller bearing spindle; covered vee bed, swing over bed 23 1/2in.; hollow spindle 6 1/2in. dial good equipment; Chasing saddle with automatic sliding and surfacing feeds.  
 HERBERT No. 21 Combination Turret Lathe: swing 28in. over the bed; 7 1/2in. hollow spindle; chasing saddle with automatic sliding and surfacing feeds.  
 LIBBY 4A Capstan Lathe, 2 1/2in. hollow spindle, 20 1/2in. swing, speed 27-725.  
 WARD No. 7 Combination Turret Lathe, 14 1/2in. Swing, 2 1/2in. Hollow Spindle, Speeds 19-520 r.p.m. Chasing Saddle, Tool Chuck.  
 No. 12 RYDERMATIC three slide Vertical Multi-tool Lathe; maximum swing 20in.; maximum length 16 1/2in.; vertical slide stroke 8in.; horizontal slide stroke 5 1/2in.  
 CLEVELAND 2 1/2in. Model B Auto.

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TOWN 5ft. Radial Drilling Machine; spindle No. 5 Morse taper; speed 26-580 r.p.m.  
 CINCINNATI BICKFORD 36in. Radial Drilling Machine, spindle No. 4 M.T.  
 SEIG (swedish) 27in. Radial Drilling Machine 1 1/2in. capacity, speed 80-890 r.p.m. (New).  
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 ARCHDALE No. 2240 28in. production type Drilling Machines, capacity in mild steel 3in. dia.  
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 HERBERT Type C Pedestal Drilling Machine. No. 3 Morse Taper, 230 volts, single phase. Auto spindle feed, flange mounted motor.

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 DECKEL Engraving machine.

359-361, EUSTON RD., LONDON, N.W.1  
 Telephone: EUSTON 5000 Telex: 24264

And at Lansdowne House, 41, Water St., Birmingham, 3. Telephone: Central 7606-8

**Kitchen & Wade H3 Horizontal**  
 Boring and Drilling Machine complete with Indexing Table.

Further details from:-  
 C. & G. OLDFIELD, LTD.  
 15, Abercorn Street  
 PAISLEY.

**12 1/2in. Centre Swift Heavy-duty**  
 2 m/d. all-std. hollow-spindle S.S. & S.C. Lathe with two saddles each with taper turning attachments. 20 h.p. 400/3/50 motor. 18 spindle speeds 1.5-94 r.p.m. Spindle mounted in Timken roller bearings. - LEE & HUNT, LTD., Crocus Street, Nottingham. Phone 84246.

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By Order of R. P. Matthews, Esq., F.C.A., Receiver and Manager

Re: F.M.T. Engineering & Design Co. Ltd.

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are instructed to offer for SALE BY AUCTION  
 at THE WORKS on

**Thursday, 6th July, 1961**

at ELEVEN A.M.

AS A FIRST LOT

The Beneficial Interest in the Lease of the

**COMPACT BRICK BUILT**

**SINGLE STOREY FACTORY**

incorporating SUITE OF OFFICES and containing a total approximate  
 FLOOR SPACE OF 11,600 SQ. FT.

All main services. Central heating to majority of the Works  
 SPACIOUS OPEN YARD with EXCELLENT DRIVE-IN ENTRANCE  
 Held on Lease renewable to give a total unexpired term of approximately  
 7 1/2 years at a Rental of £750 p.a. exclusive  
 VACANT POSSESSION

TO BE FOLLOWED BY THE SALE IN LOTS IN DETAIL of the

**SHEET METAL WORKING PLANT  
 MACHINERY, STORES & EQUIPMENT**

including  
 INCLINABLE AND RIGID POWER PRESSES UP TO 75 TONS  
 by "Taylor & Challen," "Rhodes," "Horden & Mason," "Lecra," "Schuler,"  
 "Sweeney & Blocksidge," "Edwards," "Humphris," "Primon" and others  
 "MORGAN" 4 ft. 6 in. and 6 ft. GEARED AND UNGEARED GUILLOTINES  
 10 TO 50 kVA ELECTRIC SPOT WELDERS  
 by "Holden & Hunt," "A.J." "Impetus" and "Met-Vick"  
 S.S. & S.C. AND CAPSTAN LATHES  
 HORIZONTAL AND VERTICAL MILLING MACHINES  
 "BAKEWELL" TAPPING MACHINES "ALBA" TYPE 4S SHAPER  
 METAL BAND SAWS "WRIGHT" 8 in. TABLE GRINDER  
 BENCH AND PILLAR DRILLING MACHINES  
 AIR COMPRESSOR SETS "HYCADDY" STACKING TRUCK  
 "MORRIS" 1 TON HAND OVERHEAD TRAVELLING CRANE  
 ENGINEERS' SMALL TOOLS AND TEST EQUIPMENT  
 30 TONS STEEL SHEET AND STRIP  
 OFFICE FURNITURE AND EQUIPMENT

Combined Particulars of the Property and Catalogue of the Plant, Machinery and Equipmen  
 may be obtained of:

Messrs. ROOKE LANE & Co., Chartered Accountants, 2 Norfolk Street, London, W.C.2  
 Telephone: Temple Bar 3206, of  
 Messrs. FARRER & Co., Solicitors, 66 Lincoln's Inn Fields, London, W.C.2. Telephone:  
 HOLborn 9756, and of  
 Messrs. HENRY BUTCHER & Co., 73 Chancery Lane, London, W.C.2. Telephone: HOLborn  
 8411 (8 lines)

When answering advertisements kindly mention MACHINERY.

# RING BELLS for machine tools

LEEDS 63-7398

BY ORDER OF THE RECEIVER, C. E. M. EMMERSON, ESQ., F.C.A.

RE: WALTER INSTRUMENTS LIMITED.

GARTH ROAD,  
MORDEN, SURREY

**HENRY BUTCHER & CO.**

are instructed to offer for SALE BY AUCTION in LOTS,

at THE WORKS, on

WEDNESDAY, 10TH JULY, 1961  
AND DAY FOLLOWING at ELEVEN A.M.  
EACH DAY, the

## PLANT, MACHINERY, STORES AND EQUIPMENT

including

S.S. & S.C. AND CAPSTAN LATHES  
by "Reed Prentice", "Southend" and others  
GRINDING, SHAPING AND SAWING  
MACHINES

MILLING MACHINES

by "Cincinnati", "Archdale" and others  
RADIAL, PILLAR AND BENCH DRILLS  
"NEWALL" No. 0 JIG BORER  
SINGLE SPINDLE AUTOMATICS  
by "C.V.A." and "Brown & Sharpe"

"POWER PRESSES UP TO 100 TONS  
by "Rhodes", "Taylor & Challen" and others  
POWER AND TREADLE GUILLOTINES

by "Rhodes", "Keetons" and "Rushworth"  
"ARTOS" WIRE CUTTING AND STRIPPING  
MACHINE

COIL WINDERS WAX POTS DRYING OVENS  
PLATING VATS AND BARREL UNITS  
MOTOR GENERATING SETS AND RECTIFIERS

AIR COMPRESSORS SPRAY BOOTHS  
LABORATORY AND TEST EQUIPMENT  
ENGINEERS' AND INSPECTION TOOLS

Bench Racks Cupboards Time Clocks  
OFFICE FURNITURE AND EQUIPMENT  
MOTOR VEHICLES

NOTE: THE FREEHOLD LAND AND BUILDINGS, occupying a FLOOR SPACE of about 56,000 SQUARE FEET and a GROUND AREA of approx. 3 ACRES, will be offered for Sale by Auction at the Works immediately prior to the Sale of the Plant, Machinery and Equipment.

Particulars and Conditions of Sale of the Property, also Catalogue of the Plant, Machinery and Equipment (when ready) may be obtained of

Messrs. JOSOLYNE, MILES & Co., Chartered Accountants, 28, King Street, Cheapside, London, E.C.2, of

Messrs. LINKLATER & PAINES, Solicitors, 59, Gresham Street, London, E.C.2, and of Messrs. HENRY BUTCHER & Co., Auctioneers, Valuers and Surveyors of Factories, Plant and Equipment, 73, Chancery Lane, London, W.C.2.

Telephone: HOLBORN 8411 (8 lines)

**Brown & Sharpe OOG tin. Cap.**  
Auto Screw Machine, Serial No. 14537.  
Complete Bar Feed and Turret Equipment, etc.

Further details from:—

C. & G. OLDFIELD, Ltd.,  
15, Abercorn Street,  
PAISLEY.

**Churchill Cylindrical grinder,**  
18in. x 6in. hydraulic trav. Hydraulically  
bearings, 400/3/50, also Brown and Sharpe No. 5, cyl. 4in. x 10in. ex. cond.—C. L. THOMAS  
Ltd., Stirling Road, Solihull. Tel.: 3075-6.

**Kitchen & Wade H.3 Horizontal**  
Boring, Drilling and Milling Machine,  
with 9ft. 6in. Square Table and Auxiliary  
Table. New 1956. Excellent condition.

Further details from:—

C. & G. OLDFIELD, Ltd.,  
15, Abercorn Street,  
PAISLEY.

BY ORDER OF THE RECEIVER, R. P. MATTHEWS, ESQ., F.C.A. RE: RLJON  
ENGINEERING CO. LTD.

INDUSTRIAL TRADING ESTATE,  
SWINDON

**HENRY BUTCHER & CO.,**

are instructed to offer for SALE BY AUCTION in LOTS at THE WORKS on

WEDNESDAY, 28th JULY, 1961, AND DAY  
FOLLOWING

at ELEVEN A.M. EACH DAY

## THE CONTENTS OF THE WORKS

including

S.S. & S.C. & MULTI CUT LATHES by  
"Mitchell", "Cardiff", "Herbert", "B.S.A." and others

AUTOMATIC CAPSTAN & TURRET LATHES  
by "Herbert" & "Ward"

RADIAL, PILLAR & BENCH DRILLS  
by "Archdale", "Pollard", "Asquith" and others

SINGLE AND MULTI SPINDLE  
AUTOMATICS

"Index", "Acme", "Gridley", "Skoda", "Traub",  
"Brown & Sharpe"

HONING, ROTO, FINISH AND WELDING  
MACHINES

MILLING MACHINES  
by "Cincinnati", "Milwaukee", "Victoria" and others

"UNION" HORIZONTAL BORERS  
TAPPING, SAWING, FILING AND HACK-  
SAWING MACHINES, CYLINDRICAL,  
SURFACE AND TOOL AND CUTTER

GRINDERS  
by "Landis", "Cincinnati", "Scriveners",  
"D.N.L." and others

"STORVIC" 18in. COLD SAW  
FURNACES, OIL REPARATOR, SURFACE  
TABLES, AIR COMPRESSORS

"LANSING BACNALL" FORK LIFT TRUCK,  
DIESEL TRACTOR  
MACHINE TOOLING, INSPECTION  
EQUIPMENT

OFFICE FURNITURE AND EQUIPMENT  
CONSIDERABLE STOCKS AND STORES

Catalogues (when ready) may be obtained of:  
Messrs. ROOKE, LANE & CO., Chartered  
Accountants, 2, Norfolk Street, London,  
W.C.2, and of

Messrs. HENRY BUTCHER & CO., 73,  
Chancery Lane, London, W.C.2. Telephone:  
HOLBORN 8411 (8 lines).

## Quickwork - Whiting No. 48L.

Stamping Trimmer for sale. For trimming  
any type of stamping up to 1/4in. mild steel.

The 40in. dia. table is tilting and supports the  
stamping during trimming. Three cutting  
speeds, 15, 30, 55 feet per minute. Dia. of  
spindles 1 1/2in. Arranged motor drive 400/440/3/50.

—Photograph etc. from F. J. EDWARDS,  
LTD., 359, Euston Road, London, N.W.1, or  
41, Water Street, Birmingham 3.

## Rowland Fetting Grinder. With

30in. x 2 1/2in. wheels. For sale.—BOX  
D23, MACHINERY, Clifton House, Euston Road,  
N.W.1.

## British Jeffrey Diamond Flex-

tooth Crusher. Size 24in. x 20in.  
Driven by 17 h.p. motor 400/3/50. New in  
1960.—Offers to BOX D22, MACHINERY, Clifton  
House, Euston Road, N.W.1.

## Huller UG3 Tapping Machine,

1955. 400/3/50.—BOX C902, MACHINERY,  
Clifton House, Euston Road, N.W.1.

By Direction of Messrs. Midland  
Repetition & Auto Manufacturing Co.,  
Ltd., following Production

Reorganisation.

Auction Sale at

DAYTON ROAD

INDUSTRIAL ESTATE,

EXHALL, COVENTRY

of the

MODERN MOTORIZED

## MACHINERY & PLANT

Including Electric Motors, ARC and  
SPOT WELDERS, Bench Drillers and  
Grinders, "KEETONA" GUILLO-

TINE, "Manchester" Hack-saw,

Metal Racks, "RICHMOND"

MILLERS, "Universal" Grinder,

"HERBERT" and PROGRESS

DRILLERS, "PRATT & WHITNEY"

and "CINCINNATI" DUPLEX

MILLERS, Hand Shears, "ED-

WARDS" 6in. POWER GUILLO-

TINE, "Myford" Lathe, "Landis"

Threadmillers, "TOWNE" &

"AMERICAN TOOL" RADIAL

DRILLERS, "Asquith" Keyseater,

"EDWARDS" 8ft. by 16 GAUGE

H/D FOLDER, "GREEN WOOD-

BATLEY" 80-ton POWER PRESSES,

quantity Steel Tube and Angle,

"Goodwin" 3 1/2 Concrete Mixer,

and other Trade Equipment.

## SHAW, GILBERT & CO.,

F.A.I.

are favoured with instructions to Sell

by Auction as above on

WEDNESDAY, 28th JUNE, 1961.

Commencing at 11 o'clock prompt.

ON VIEW: 27th June (10 a.m.-4 p.m.).

Catalogues on application from  
Chartered Auctioneers' Office: "Newton  
Chambers" 43, Cannon Street, Birming-

ham 2. Phone MIDLAND 4784.

## Horizontal Disc Lapping Ma-

chine, Newall Model 10 V. Excellent

condition. £150.—BOX D3, MACHINERY,

Clifton House, Euston Road, N.W.1.

## MISCELLANEOUS FOR SALE

## Cannings Plating Generator Set

for sale. Input 400-440/3/50, Output 750  
amps. 0 to 10 V. D.C. Complete with control  
panel, meters, circuit breaker, etc. In really  
excellent condition. Accept low price to clear.

—BOX D1, MACHINERY, Clifton House, Euston  
Road, N.W.1.

## VEE BLOCKS

In pairs by well-known makers,  
ex-government surplus, store soiled  
but good. Size 5" x 3 1/2" x 1 1/2"

25/- pair

WM. HURLOCK (JNR.) LTD. (Estab. 1904)

5-7 Kingston Hill, Kingston-on-Thames

Surrey. KIN 4526-7-8

When answering advertisements kindly mention MACHINERY.

# SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

## Automatics Expert Required

for sale and service of Continental precision machine tools from London. Experience with tooling design and layout for Swiss-type autos essential. Must have personality to advise clients. Interesting, well-paid post for someone who likes mixture of inside and outside work.—BOX C957, MACHINERY, Clifton House, Euston Road, N.W.1.

## Highly Paid, Secure and Interest-

ing posts are always available for technically trained men. Find out how you can put some letters after your name by preparing at home on "No Pass—No Fee" terms. A.M.I.Mech.E., A.M.I.Prod.E., A.M.S.E., City and Guilds, etc. Full details of exams, and hundreds of courses in all branches of Engineering, Draughtsmanship, Management and Automation Techniques, the benefits of our Employment Dept., and unique record of 96 per cent. successes are given in "Engineering Opportunities"—a valuable 148-page Guide which will reveal many chances you are now missing.—Write for your copy today (stating subject of interest).—FREE and without obligation. B.I.E.T. (Dept. 43a), 29, Wright's Lane, London, W.8.

## MACHINE TOOL SALESMAN MIDLANDS

We are a progressive and expanding manufacturer of Fine Bore and also hold the Sales Agency for a number of first class Continental Machine Tool Makers. We require a Machine Tool SALESMAN for Birmingham, who, because of the great potential of the area, must be fully qualified technically for this work. Selling experience is highly desirable but not essential as a full training in sales technique will be given. Initial salary will be up to £1,200 per annum with the opportunity of earning considerably more by commission. A car and expenses will be provided. Applications will be treated in complete confidence and must give details of past experience, current position and earnings. Reply to:—

Managing Director,  
STUART DAVIS LTD.,  
P.O. Box 21,  
Stonebridge Highway, Coventry.

## Mechanic Required to Work on

a wide variety of electro-mechanical Instrumentation and Control Equipment. Previous experience in this class of work is not essential but applicants should have some knowledge of precision or light fitting work together with a keenness to learn. The post is a permanent one in the Electricity Supply Industry. Interest in electrical or electronic devices would be an advantage. The rate of pay is £11 13s. 8d. for a 42-hour week. Sick Pay, Pension and Holiday Schemes are available after qualifying periods. Canteen and Sports Club facilities on the site.—Applications, giving details, to: STATION SUPERINTENDENT, EARLEY GENERATING STATION, Shepherds House Lane, Earley, Nr. Reading.

## CHAMBERLAIN INDUSTRIES LIMITED

have immediate vacancies for the following skilled personnel:—

CENTRE LATHE TURNERS  
VERTICAL BORER  
RADIAL ARM DRILLER

Top rates paid

Overtime worked

INSPECTOR for Machine  
Shop work  
Staff Appointment

Apply Personnel Officer,  
Argall Avenue, Leyton, E.10,  
or phone Mr. Howell LEY 3678

## Foreman Required for Small

factory S.W. London. Progressively minded young Engineer who should have served a good apprenticeship including toolroom and drawing office training. Experience of thread grinding an advantage. Able to control small labour force. Non-contributory pension scheme. —Apply giving details of age, education, apprenticeship, experience, to BOX C 1000, MACHINERY Clifton House, Euston Road, N.W.1.

## Jig and Tool Estimator required

—previous experience essential in pricing all types of tooling to the trade. Mitcham area.—BOX D2, MACHINERY, Clifton House, Euston Road, N.W.1.

## Machine Tool Sales Office, N.W.

London, require Manager to handle correspondence and negotiate sales with customers for new and secondhand machine tools.—Good salary and excellent prospects. BOX C973, MACHINERY, Clifton House, Euston Road, N.W.1.

## KENT EDUCATION COMMITTEE GRAVESEND TECHNICAL COLLEGE

Applications are invited from suitably qualified persons for the following full-time appointment to commence from 1st September, 1961:—

ASSISTANT LECTURER Grade A for Engineering Science and Drawing, Trade Calculations and ability to instruct in Mechanical or Electrical Workshop Practice.

SALARY: Burnham Technical (under review) £520 x £27—£40 to £1,000.

Application forms and further particulars from the PRINCIPAL, Technical College, Darnley Road, Gravesend.

A vacancy exists in our  
Production Machine Shop  
(currently engaged in small batch work)  
for an experienced

## FOREMAN

The selected candidate must be able to achieve mutually agreed production targets in the following classes of work: Centre Lathe Turning; Capstan Turning; Surface Grinding; Vertical and Horizontal Milling; Sheet Metal; Bench Fitting; Instrument Assembly.

It is not expected that sufficient experience will have been gained for this position if the applicant's age is less than 35 years. There is a canteen available; we work a five-day week, and a Sports and Social Club is in existence. It is envisaged that the selected applicant would enjoy staff conditions and eventually a salary of up to £1,000 per annum. Apply in first instance to Production Manager.

Thermionic Products (Electronics) Limited  
Shore Road, Hythe, Southampton  
Telephone: Hythe 3265

## TOOL DESIGNERS

Required for the design of assembly tools and fixtures. Practical experience essential. Minimum qualification O.N.C.

Opportunities for advancement. Salary according to age and experience. North West London area.

Write in confidence to:

BOX D19, MACHINERY,  
Clifton House, Euston Road, N.W.1.

## R.R.E. COLLEGE OF ELECTRONICS

Ministry of Aviation,  
Royal Radar Establishment,  
MALVERN

## Grade B Assistant Lecturer

required to teach Workshop Technology, Science, Calculations and Drawing for C. & G. courses.

Applicants should be suitably qualified, i.e. preferably a degree or equivalent, and have teaching and/or industrial experience.

Burnham Salary Scale Grade B, £700 x £27 10s.—£1,150; subject to Teachers' Superannuation Acts.

Further details and application forms from the Principal for return within two weeks of the appearance of this advertisement.

## Design Draughtsman required

by expanding company to specialise in design and development of hydraulic components for transmission and other equipment. Excellent opportunities to widen experience and good prospects for advancement. H.N.C. or equivalent desirable. Previous experience of hydraulics not essential.—Write or telephone Mr. BEDFORD OF CHAMBERLAIN INDUSTRIES Ltd., Argall Avenue, Leyton, E.10. LEY 3678.

When answering advertisements kindly mention MACHINERY.

**Production and Planning Engineer** required by well established Engineering Company in N.W. London. The post is a permanent staff appointment and a Life Assurance and Contributory Staff Pension Scheme is in operation.—Please write giving particulars of age, experience, qualifications, salary expected, etc., to BOX D14, MACHINERY, Clifton House, Euston Road, N.W.1.

**Inspector required for Machine** shop work. Able to line out castings for fabrications. Knowledge of hydraulics preferred but not essential. Good salary. Staff appointment. Only fully skilled need apply.—Apply PERSONNEL OFFICER, CHAMBERLAIN INDUSTRIES LTD., Argall Avenue, Leyton, E.10, or phone Mr. Howell, LEY 3678.

### REPRESENTATIVES

**Opportunity Knocks for young** man, quick witted with good personality, to train with Machine Tool Firm, to take up position as Rep.; great possibilities.—BOX D10, MACHINERY, Clifton House, Euston Road, N.W.1.

**Engineers' Suppliers require** Experienced Representative for S.W. London and the Home Counties, to take over and expand existing connection. Top salary offered to first class man. Car provided and all expenses paid.—Our present staff have been informed and replies should be addressed to Managing Director, BOX D17, MACHINERY, Clifton House, Euston Road, N.W.1.

### REPRESENTATIVE

Required for the sale of PUREFOY STANDARD PARTS for jigs and fixtures and DIE SETS; only first class man, whose ambition is to work hard and earn good money, need apply: resident in a district suitably situated to cover the main industrial areas in MIDDLESEX, ESSEX and HERTFORDSHIRE. Necessary qualifications: tenacity and loyalty, pleasing personality and good appearance, reasonable technical knowledge; must own car. Aged between 25 and 35 years. For further details apply, in writing, giving nationality, experience and all relevant particulars to

**T. BROWN, Sales Manager,  
PUREFOY UNIT TOOLING Ltd.,  
Upper Tilt Works, Cobham, Surrey.**

### Specialist Salesman

is required for an important Machine Tool Company dealing in Forging Hammers and Plant Equipment.

Applicants must be Practical Engineers with a knowledge of Forging Practice and be willing to visit companies throughout the United Kingdom. A motor car will be provided and usual out-of-pocket expenses.

This is a progressive position with a well known company and an attractive pension scheme is in operation.

Please state details of experience and salary required to

**BOX D13, MACHINERY,  
Clifton House, Euston Road, N.W.1**

## WHEN YOU WANT . . .

- TO BUY OR SELL PLANT OR MATERIAL
- WORK FOR A SLACK DEPARTMENT
- AGENCIES OR PARTNERSHIPS
- MEN FOR EXECUTIVE POSITIONS

A SMALL ADVERTISEMENT IN

"MACHINERY" BRINGS RESULTS.

## SITUATIONS WANTED

### Technical Sales Manager.

London. Does not want "Job." If you are expanding and require your share of the £100 million machine tool market—Please contact SYD. 4929 or BOX C974, MACHINERY, Clifton House, Euston Road, N.W.1.

### Senior Position Required by

estimating engineer specialising in the costing of special purpose machinery and associated equipment. Fully conversant with general sales procedure and able to handle projects from the initial enquiry stage through to the finalised issue of quotation to the customer.—BOX C989, MACHINERY, Clifton House, Euston Road, N.W.1.

### Engineer with over 30 years

supervisory technical and practical experience. Any position considered for moderate salary.—BOX D8, MACHINERY, Clifton House, Euston Road, N.W.1.

### REPRESENTATIVE

### Educated and experienced sales

engineer, late thirties, fluent French, desires post preferably on sales of first class machine tools in London and home counties.—BOX D9, MACHINERY, Clifton House, Euston Road, N.W.1.

## RECEIVED TOO LATE FOR CLASSIFICATION

### PATENTS—TRADE MARKS

#### The Proprietors of British

Patents Nos. 673186 for "Improvements Relating to Pipe Couplings", and 746807 for "Pipe Connection", desire to enter into negotiations with a firm or firms for the sale of the patents, or for the grant of licences thereunder. Further particulars may be obtained from Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

### MATERIALS FOR SALE

#### Surplus Material in new condition.

KEA. 108.  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $1\frac{1}{2}$ ,  $2\frac{1}{2}$ ,  $3\frac{1}{2}$ ,  $4\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $6\frac{1}{2}$ ,  $7\frac{1}{2}$ ,  $8\frac{1}{2}$ ,  $9\frac{1}{2}$ ,  $10\frac{1}{2}$ ,  $11\frac{1}{2}$ ,  $12\frac{1}{2}$ ,  $13\frac{1}{2}$ ,  $14\frac{1}{2}$ ,  $15\frac{1}{2}$ ,  $16\frac{1}{2}$ ,  $17\frac{1}{2}$ ,  $18\frac{1}{2}$ ,  $19\frac{1}{2}$ ,  $20\frac{1}{2}$ ,  $21\frac{1}{2}$ ,  $22\frac{1}{2}$ ,  $23\frac{1}{2}$ ,  $24\frac{1}{2}$ ,  $25\frac{1}{2}$ ,  $26\frac{1}{2}$ ,  $27\frac{1}{2}$ ,  $28\frac{1}{2}$ ,  $29\frac{1}{2}$ ,  $30\frac{1}{2}$ ,  $31\frac{1}{2}$ ,  $32\frac{1}{2}$ ,  $33\frac{1}{2}$ ,  $34\frac{1}{2}$ ,  $35\frac{1}{2}$ ,  $36\frac{1}{2}$ ,  $37\frac{1}{2}$ ,  $38\frac{1}{2}$ ,  $39\frac{1}{2}$ ,  $40\frac{1}{2}$ ,  $41\frac{1}{2}$ ,  $42\frac{1}{2}$ ,  $43\frac{1}{2}$ ,  $44\frac{1}{2}$ ,  $45\frac{1}{2}$ ,  $46\frac{1}{2}$ ,  $47\frac{1}{2}$ ,  $48\frac{1}{2}$ ,  $49\frac{1}{2}$ ,  $50\frac{1}{2}$ ,  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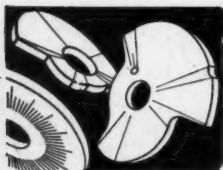
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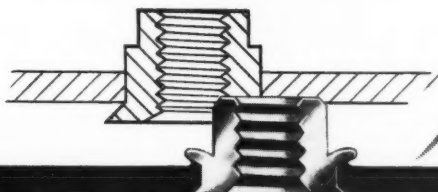
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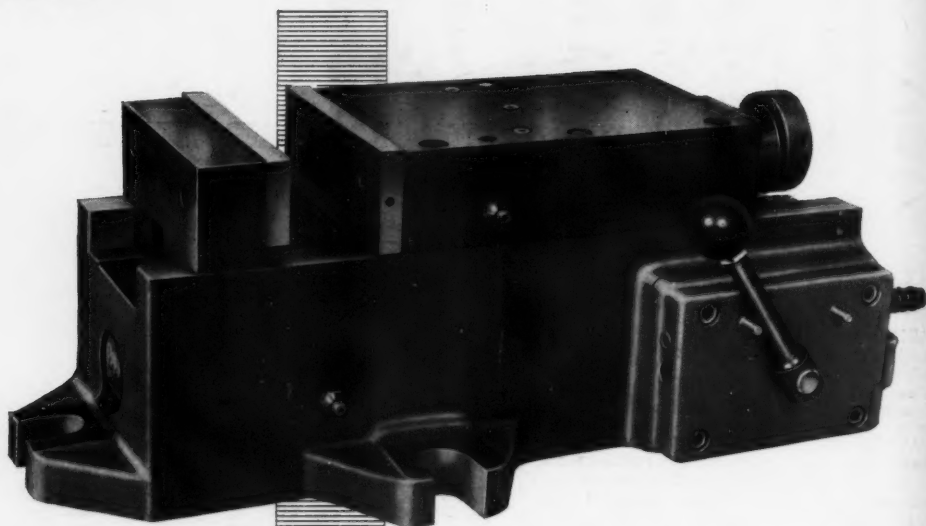
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|                                |                    |                    |
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| Width of Jaw                   | 4 $\frac{1}{8}$ "  | 6"                 |
| Depth of Jaw                   | 1 $\frac{3}{8}$ "  | 1 $\frac{7}{8}$ "  |
| Maximum Opening                | 2 $\frac{1}{2}$ "  | 4 $\frac{1}{4}$ "  |
| Minimum Opening                | 0"                 | 1 $\frac{3}{8}$ "  |
| Power Movement                 | $\frac{1}{8}$ "    | $\frac{1}{8}$ "    |
| Gripping Force<br>at 90 P.S.I. | 4,800 lbs          | 7,700 lbs          |
| Length Overall                 | 15 $\frac{1}{2}$ " | 19 $\frac{1}{2}$ " |
| Width Overall                  | 7 $\frac{1}{2}$ "  | 9 $\frac{1}{2}$ "  |
| Height Overall                 | 5 $\frac{1}{4}$ "  | 6 $\frac{1}{8}$ "  |
| Weight (approx.)               | 54 lbs             | 126 lbs            |

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